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PUMA Energy Caribe, LLC

Current Conditions Report

Former Caribbean Petroleum Refining Facility
Bayamón, Puerto Rico

November 2011
Revised: May 2012

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Former Caribbean Petroleum
Refining Facility
Bayamón, Puerto Rico

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Our Ref.:
B0045709

Date:
May 22, 2012

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1. Introduction

BBL Caribe Engineering P.S.C. (BBL Caribe, also known as ARCADIS Puerto Rico) prepared this Current Conditions Report (CCR) on behalf of PUMA Energy Caribe, LLC. (PUMA) for the property located on Road PR-28, km 2, Luchetti Industrial Park, Bayamón, located in the Commonwealth of Puerto Rico (the Facility, **Figure 1**). ARCADIS Puerto Rico prepared this CCR in accordance with the applicable criteria set forth in Task I of Attachment II of the 1995 Administrative Order on Consent, Docket No. II RCRA-95-3008(h)-0303 and the subsequent (2011) modification of the 1995 Administrative Order on Consent (the agreement with the new purchaser (PUMA)), Docket No. RCRA-02-2011-7305. **Figure 2** presents the Facility layout.

The 1995 Corrective Action Order (Order) outlined in the Administrative Order on Consent required a CCR, as well as a site-wide Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) to be completed. The Order required that 35 solid waste management units (SWMUs) and areas of concern (AOCs) identified at the Facility be investigated for potential releases of hazardous constituents to the environment. **Figure 3** presents the locations of the SWMUs and AOCs identified under the Order. The Order also required that a site-wide hydrogeological investigation be conducted. A RFI went underway in 1998, and continued through 2009.

A series of explosions and fires at the terminal damaged or destroyed many of the storage tanks at the Facility on October 23, 2009. An unknown quantity of petroleum was released during the incident. It is likely that the fire consumed much of the released material, but at least some was conveyed in runoff to Las Lajas Creek and an associated wetlands area to the north of the active portions of the Facility. The RFI was put on hold, so that post-fire conditions may be assessed in order to better surmise the more representative AOCs.

The previous owners of the Facility, Caribbean Petroleum Refining (CPR), Caribbean Petroleum Corporation (CPC), and Gulf Petroleum Refining (Puerto Rico) Corporation (collectively, the “Debtors”) filed a voluntary petition for relief pursuant to Chapter 11 of the United States Bankruptcy Code on August 12, 2010. The Debtors pursued a sale of substantially all of their assets as part of the bankruptcy proceedings, which included the Facility.

PUMA purchased the Facility on May 11, 2011, and has voluntarily entered into four agreements with the United States Environmental Protection Agency (USEPA) and the Puerto Rico Environmental Quality Board (EQB) to address certain environmental

conditions at the Facility so as to protect human health and the environment in the vicinity of the Facility, as well as the greater community in Bayamón, Puerto Rico. The agreements (USEPA Orders) are as follows:

- Compliance and Prospective Purchaser Order Agreement Index No. RCRA-02-2011-7504
- Agreement and Order on Consent Docket No. CERCLA-02-2011-2003
- Agreement with New Purchaser Docket No. RCRA-02-2011-7305 and Administrative Order on Consent Docket No. II-RCRA-95-3008(h)-0303
- Agreement and Order on Consent for Removal Actions Docket No. CWA-02-2011-3021

As mentioned above, this CCR has been prepared to satisfy the requirements of the 3008(h) Order. **Appendix A** includes a copy of the Order. PUMA retained ARCADIS Puerto Rico to address the environmental areas of interest.

2. Facility Background

The Facility is located at Road PR-28, km 2, Luchetti Industrial Park in Bayamón, Puerto Rico. The land use in the vicinity is primarily commercial. Commercial properties border the Facility to the south and west, Fort Buchanan to the east, and Highway PR-22 to the north.

2.1 Location

The Facility is located in the Luchetti Industrial Park, approximately three miles south of the island's coast with the Atlantic Ocean. The entire Facility encompasses approximately 179 acres, of which 115 acres are developed and the remainder is a wetland. **Figure 1** shows the general location of the Facility and physiographic features of the surrounding area. Four general areas divide the Facility: a tank farm, an inactive process area, an administration area, and a wastewater treatment plant (WWTP).

Several one-story buildings, over 40 storage tanks, pipelines, appurtenances, and supporting facilities constructed improved the Facility during different phases over history. Associated paved parking and landscaped areas covers the remaining portions of the Facility. The remaining 64 acres is a wetland, located on the northern portion of

the property. Road PR-28 provides vehicular access to the property. **Figure 2** presents the current layout of the property.

In addition, PUMA owns a loading dock facility on the San Juan Bay in Guaynabo, approximately two and one-half miles from the Facility. Fuel was transferred from the dock to the Facility via an aboveground pipeline.

2.2 Environmental Setting

2.2.1 Topography

The Facility is situated at an approximate elevation between 10 and 35 feet above mean sea level (amsl), with a general surface gradient sloping to the north. The nearest surface water body is the Las Lajas Creek, located at the north of the Facility, based on the most recent revised United States Geological Survey (USGS) topographic map, Bayamón Quadrangle, 1969 (photorevised 1982). The Diego Creek runs 100 meters northwest of the Facility (**Figure 1**).

2.2.2 Geology

Soils at the Facility are predominantly low-permeability clays. The overburden thickness varies from about 10 feet at the southern perimeter of the Facility to about 90 feet at the northern perimeter (USEPA 2008).

A layer of carbonate sediments overlying limestone bedrock is located beneath the clay soils. Undulations of the carbonate sediment layer result in natural “domes” covered by clay soils.

The Facility is located on alluvium (Qa) formation, consisting of sand, clay, and sandy clay based on the USGS Geologic Map of the Bayamón Quadrangle (Monroe 1973) and beds of sand containing gravel and cobbles in the valley of the Río Bayamón. Thickness is variable; as much as 25 meters has been penetrated in some wells (ARCADIS Puerto Rico 2011a).

2.2.3 Hydrogeology

Two general hydrogeologic units occur at the Facility. The uppermost clay unit contains a low permeability semi-perched layer and a permeable water-bearing zone (referred to as Zone A in CPR documents). The general horizontal groundwater flow direction in

Zone A is to the north, although localized mounds and depressions reportedly occur in the central portion of the Facility. The underlying carbonate sediment layer also contains a water-bearing zone (referred to as Zone B in CPR documents). Groundwater flow in Zone B is generally in the north to northwest direction (USEPA 2008).

Groundwater in Zone B is generally confined, meaning that the water table for wells completed in the carbonate sediment layer generally is at a higher elevation than the water table for the overlying clay soils. Groundwater gradients are relatively flat in the area. Water migration into and through the surface soils is slow as a result of the Facility's geology. **Figure 4** and **Figure 5** present a depiction of the groundwater elevations (measured in 2009) and flow directions in Zone A and Zone B at the Facility, respectively.

Free product existed as a light non-aqueous phase liquid (LNAPL) in different portions of the terminal property floating on groundwater both in the clay soil layer and in the carbonate sediment layer (larger volumes) based on the various subsurface investigations conducted by Anderson, Mulholland & Associates, Inc., and as concluded in the USEPA's 2008 Environmental Indicators (EI) Report (USEPA 2008). LNAPL is essentially pushed upward by the water in the carbonate sediment layer, and trapped against the overlying clay soils due to undulations of the carbonate sediment layer. Under these conditions, floating free product in the carbonate sediments is essentially unable to migrate, or may migrate only slowly.

Additionally, select dissolved-phase volatile organic constituents (VOCs), base-neutral analytes (BNAs) and metals have been detected in historical Zone A and Zone B groundwater samples. Some of these concentrations are attributable to previous operations at the Facility and/or dissolution of the LNAPL plumes, while others are attributable to offsite sources. As documented in the 2004 Sitewide Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004), no evidence of offsite groundwater impact due to Facility operations was historically found. Groundwater impacts based on the findings of historical investigations are discussed in Section 3. However, the current (post-fire) conditions of groundwater impacts are uncertain.

2.2.4 Surface Water and Wetlands

The nearest surface water bodies are Las Lajas Creek and Diego Creek. An undeveloped wetlands area associated with Las Lajas Creek comprises a portion of the northernmost 64 acres of the Facility.

Las Lajas creek is a low-flow, shallow stream that originates in the hills south of the Facility, traverses through the north-central part of the Facility, and eventually discharges into the San Juan Bay. The creek is channeled underground as it enters the Facility and returns to an open channel north of the Facility's WWTP area. The Diego Creek is a shallow, low-flow creek that traverses through the northwest portion of the Facility. An outfall conveys the storm water discharges to Las Lajas Creek (Outfall 002). The Facility has a National Pollutant Discharge Elimination System's (NPDES) storm water discharge permit (Facility ID No. PR0000370).

It should be noted that the USEPA, under Nationwide Permit 20, constructed a gabion retaining wall and earthen berm containing a flow control structure (underflow dam) across Las Lajas Creek as part of the October 2009 fire management activities to help restrict potential downgradient migration of released petroleum product,. These water control structures were constructed to restrict the hydrologic connection with the downgradient portion of Las Lajas Creek. They remain in-place and will be evaluated as part of the facility-wide corrective action.

2.3 Surrounding Properties

Properties surrounding the Facility mainly consist of industrial properties, a military base, and undeveloped land. The adjacent properties include the following:

- North: Road PR-22, across which several commercial warehouses are located
- East: Road PR-28, across which is Fort Buchanan, a U.S. military base
- South: Road PR-28, across which is Fort Buchanan and the Julio Enrique Monagas Park
- West: Luchetti Industrial Park

The closest residence is at least 0.1 mile (military base) from the Facility based on ARCADIS Puerto Rico's observations. There is an indication that there is residual

contamination on the Fort Buchanan property that could impact the Facility based on the following (ARCADIS Puerto Rico 2011a):

- The USEPA noted that "trichloroethylene and vinyl chloride have been detected in monitoring wells along the eastern boundary of CPR" during its evaluation of EIs completed in October 2008. "This plume is considered part of a larger plume located primarily on the property of Fort Buchanan, located east of CPR. Fort Buchanan is currently in the process of identifying the source and evaluating the need for remedial actions for this plume" (USEPA 2008).

- The USEPA responded on February 4, 2011 to an on-going release of oil and possibly cooking grease and industrial waste that was discharged into a storm sewer and, ultimately, a wetland that borders the Facility to the north. This incident and the response activities conducted are documented in the USEPA June 30, 2011 pollution report for the Fort Buchanan property. The Pollution Report is included in **Appendix F**.

2.4 History

The Facility began operations as a petroleum refinery in 1955 under the name of Caribbean Refining Corporation. Gulf Oil Corporation purchased the Facility in 1962, and gave the new name Caribbean Gulf Refining Corporation. Chevron Corporation acquired ownership of the Facility when it purchased Gulf Oil Corporation in 1984. The Facility was sold to First Oil Corporation in 1987, and operated as an independent refinery under the name Caribbean Petroleum Refining, Limited Partnership.

The refinery processed imported virgin crude oil to produce petroleum distillates, fuel gases, diesel oil, asphalt, kerosene, fuel oil, gas oil, residual oils, and unleaded gasoline. The Facility previously produced leaded gasoline, but discontinued production as of January 1, 1988 (Kearney 1989). Hazardous wastes historically managed at the Facility include primary oil/water/solids separation sludge (F037), secondary oil/water/solids separation sludge (F038), slop oil emulsion solids (K049), heat exchanger bundle solids (K050), API separator sludge (K051), ignitable waste (D001), and toxicity characteristic (benzene) wastewater (D018) (USEPA 2004).

The Facility operated as a petroleum refinery between 1955 and 2000. The Facility continued to operate as a terminal for storage of a variety of petroleum products (e.g., gasoline, diesel, jet fuel, and fuel oil) following discontinuation of refinery operations in 2000. The terminal is connected via an aboveground pipeline to the loading dock

facility on the San Juan Bay, with the capability to load and unload fuel products. CPR rented a portion of its storage capacity to certain customers, including the Puerto Rico Electric Power Authority (PREPA). Other portions of the Facility were used to store and redistribute petroleum products to CPR's network of service stations located throughout Puerto Rico.

2.4.1 October 2009 Incident

Several explosions and ensuing fires occurred at the Facility on October 23, 2009. The fires largely destroyed approximately 17 tanks on the Facility, and damaged surrounding tanks and other infrastructure, including the fuel transfer pipeline. In total, about half of the Facility's tanks were damaged or destroyed. Third party emergency response contractors provided emergency cleanup and assistance at the terminal immediately following the incident. In February 2010, the USEPA issued a Unilateral Administrative Order pursuant to the Oil Pollution Act (OPA) and the Clean Water Act (CWA), directing CPR to commence cleanup and removal actions at the terminal. CPR was unable to perform such activities primarily due to financial constraints. The USEPA assumed responsibility for the cleanup activities covered by the Unilateral Administrative Order in March 2010.

The USEPA subsequently implemented response actions under the OPA for tank dismantling and removal of contaminated soil. USEPA's contractors led efforts to dismantle badly-damaged tanks, and staged the steel in designated areas on the Site for recycling (**Figure 2**). The contractors evaluated soils in the secondary containment areas and beneath the dismantled tanks as they dismantled the tanks to determine if soil should be removed. Contaminated soils were excavated and disposed off the Site at a non-hazardous waste landfill in Puerto Rico (ARCADIS Puerto Rico 2011b). Soils were excavated until the ground surface appeared clean by visual inspection. **Appendix B** shows aerial photos from before and after the 2009 fires.

PUMA purchased the Facility in May 2011, and has taken over the environmental responsibilities related to the Order, as well as the cleanup and assessments related to the October 2009 incident. As established in the May 2011 Agreement, PUMA is not responsible for the investigation and/or remediation of any historical contamination potentially released from the Facility via air emissions which have been deposited in areas which are not contiguous or adjacent to the Facility (e.g., contamination deposits in non contiguous/non adjacent locations relating to the explosion or air emissions from petroleum refining operations, etc.).

PUMA's intended use for the Facility is terminal storage only. Processing is not currently intended to continue at the Facility.

2.5 SWMUs and AOCs Requiring Investigation under the 1995 Order

The 3008(h) Order established 22 SWMUs and 12 AOCs as requiring investigation. **Figure 3** depicts the locations of these SWMUs and AOCs. These are listed below.

- SWMUs
  - SWMU 1: Container Storage Area
  - SWMU 2: Slop Oil Tank 1000
  - SWMU 3: Slop Oil Tank 1001
  - SWMU 4: Solids Knockout Pit
  - SWMU 5: Surge Tank ET-1
  - SWMU 6: API Separator
  - SWMU 7: Corrugated Plate Interceptor
  - SWMU 8: Equalization Basin
  - SWMU 9: Inlet basin to Biological Reactor #1
  - SWMU 10: Digester
  - SWMU 11: Old Oil Lagoons
  - SWMU 12: Old East Separator
  - SWMU 13: Slop Oil Tank 452
  - SWMU 19: Natural Aeration Basin
  - SWMU 32: Old Landfill
  - SWMU 33: Non-hazardous Disposal Site
  - SWMU 34: Sulfur Lagoon
  - SWMU 35: Catalytic Waste Pond
  - SWMU 37: Sulfur Drum Storage Area
  - SWMU 38: Centrifuge
  - SWMU 39: Gravity Thickener Yard
  - SWMU 40: Scrap Metal
- AOCs
  - AOC 1: Crude Unit Charge Pump Area

- AOC 2: Fuel Oil Transfer Pump (Cummins) Area
- AOC 3: Fuel Oil Transfer Pump Area near Tank 603
- AOC 4: Asphalt Heater Unit
- AOC 5: Fuel Oil Loading Rack Pump Area
- AOC 6: Debutanizer Re-boiler Area
- AOC 7: FCC Unit Compressor Lube System Area
- AOC 8: Heat Exchanger Bundles at Heavy Cycle Steam Generator
- AOC 9: Crude Unit No. 1 Area
- AOC 10: Crude Unit No.1 near Heat Exchanger Bundle Area
- AOC 11: Fuel Oil Pipeline Spill Areas
- AOC 12: Old Loading Rack

The RFI addressed most of the SWMUs and AOCs by October 2009. However, the statuses of these SWMUs and AOCs have likely changed significantly as a result of the October 2009 fire and explosion, and subsequent response and cleanup activities. This CCR will not address each SWMU and AOC individually while these will be addressed, as warranted, during future environmental activities at the Facility. For the purpose of this CCR and the work plans subsequent to it, the Facility as a whole is being re-evaluated to assess the most current (post-fire) SWMUs and AOCs that need to be addressed. Areas that have historically exhibited contamination of soil and/or groundwater, as well as areas that are known to have been affected by releases associated with the 2009 incident, will be specifically addressed during future investigations. **Appendix G** includes figures from the 2004 Sitewide Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004), which depict areas where contamination has been historically documented. The areas that will be subject to more focused investigations, and include at least the following:

- Areas with documented contamination (pre-2009), based on the 2004 Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004):
  - Former Process Sewer Area
  - Old Loading Rack
  - Wastewater Treatment Plant Area
  - Old Oil Lagoons
  - Sulfur Lagoon
  - Northeast Facility Area
- Areas impacted by 2009 incident (depicted on figures provided in **Appendix H**):

- Northern Tank Farm
- Vicinity of WWTP
- Storm water channels

As investigations are conducted, it will be determined what additional areas require more focused investigations.

2.6 RCRA Units at the Facility

There is a RCRA unit at the Facility: the closed equalization basin, also known as SWMU 8, located on the western side of the Facility (see **Figure 2**). As part of its wastewater treatment facility, CPR operated the equalization basin to receive effluent from oil/water separation units, and discharge it to a biological treatment system. The equalization basin was an unlined surface impoundment regulated under Subtitle C of the RCRA because it managed D018 and F038 wastes. The equalization basin ceased operation and receipt of hazardous waste on June 6, 1993, and an aboveground equalization tank replaced it. Sludge was removed from the bottom and sides of the basin in April 1994.

RCRA closure of the equalization basin was completed in August 1999. Activities for the closure consisted of dewatering the basin; stabilizing the residual sludge; backfilling the basin; and installing impermeable clay and flexible membrane liner cap, a drainage layer, and a vegetative cover. The USEPA approved the closure on December 3, 1999.

A groundwater monitoring system consisting of six wells (EB-101 through EB-106) was installed in 1991. A monitoring program was also implemented to allow for detection of contamination if hazardous waste or hazardous constituents migrate from the unit to the uppermost aquifer. The monitoring program was integrated into the Facility wide Groundwater Monitoring Program (SGMP) in 2002, with USEPA approval, as part of the corrective action RFI. Sampling of the closed equalization basin was conducted for select VOCs on a semiannual basis, and was reduced to annually in 2006 (Anderson, Mulholland & Associates 2009a).

Benzene concentrations were historically detected in one of the upgradient wells. It was determined that this was from an upgradient source. Concentrations decreased over time. The last sampling event was conducted in March 2009. VOCs were not detected in the monitoring wells associated with the basin. Anderson, Mulholland & Associates, Inc. determined in the 2009 monitoring report that sampling would discontinue after 2010 if contaminant levels were less than USEPA's Maximum Contaminant Levels (MCLs) in all wells, or if there were no trends of increasing

concentrations. Subsequent sampling events were however put on hold due to the October 2009 fires.

2.7 Historical Investigations

The CPR's terminal and refinery have been subject of numerous environmental investigations and response actions since at least 1980. Starting in 1980, LNAPL was removed from a cased pit located near the liquid propane gas (LPG) tanks in the old loading rack area (see **Figure 2**). It was estimated that 1,000,000 gallons of product and/or groundwater were removed using this approach. A five-well recovery system with automatic pumps was installed in 1984 to 1985. This system removed about 68,000 gallons of product and/or groundwater by May 1987 (ARCADIS Puerto Rico 2011a).

2.7.1 Groundwater Monitoring

In 1988, Geraghty and Miller, Inc. initiated a groundwater assessment that ultimately delineated the extent of LNAPL in the areas of the Facility where it was initially identified by previous consultants. Subsequently, in June 1989, Geraghty and Miller performed an assessment of dissolved hydrocarbon constituents in groundwater at the perimeter of the refinery. Another groundwater recovery system was installed in October 1989. LNAPL recovery operations began in December 1989. Regular maintenance and monitoring were conducted. These included measurements in 14 wells that are part of the recovery system and 79 additional on-site wells. In addition, LNAPL was periodically bailed from 29 wells that were not connected to the recovery system (Radian 1990).

As part of the SGMP, Anderson, Mulholland & Associates, Inc. collected groundwater samples in two phases in 2003, as documented in the 2004 Sitewide Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004). During Phase 1 (May and July 2003) groundwater was collected from wells in the vicinity of LNAPL plumes and in the northeast portion of the Facility, and from wells in the vicinity of the WWTP and process sewer, to assess the impact on groundwater, if any, from Facility operations in these areas. During Phase 2 (October 2003), groundwater samples were collected from 51 monitoring wells across the Facility. Section 3 summarizes the findings of these events. Based on the findings, additional work was proposed to confirm/delineate impacts to groundwater. However, the 2009 incident occurred before most of the work could be implemented.

Through September 2009, 131 groundwater wells were routinely monitored for the presence of subsurface free product at the Facility:

- Sixteen monitoring wells were sampled once or twice annually to evaluate migration of dissolved constituents in the groundwater
- Sixty were used to recover product
- Remaining wells were used to keep track of product "sheens" and groundwater elevations on a monthly basis

Twenty-two of the product recovery wells were automated (pneumatically operated recovery wells to continuously remove free product). About 38 were either bailed or emptied with a vacuum truck periodically to remove free product. An estimated 80,000 gallons of product were removed from the subsurface at the rate of a few hundred gallons per month between 1991 and 2009 (ARCADIS Puerto Rico 2011a).

Before the 2009 incident, groundwater monitoring was ongoing at the Facility. Groundwater sampling was conducted annually in the wells associated with the equalization basin (see Section 2.6), and semi-annually at the 16 wells associated with the underground recovery system. The 16 wells selected were intended to provide information for evaluating potential downgradient migration of dissolved constituents from the LNAPL plume at the Facility. Five of the sampled wells monitored the upper clayey sediment water-bearing zone (Zone A), and 11 monitored the unlithified carbonate sediment zone (Zone B). Select wells had also been sampled since 2003 to address identified data gaps, and provide delineation information.

The last semi-annual groundwater sampling event associated with the underground recovery monitoring system was conducted in September 2009. The last RCRA annual groundwater sampling event associated with the equalization basin was conducted in March 2009. Section 3 includes a discussion of the findings of historical groundwater assessments.

2.7.2 Soil Sampling

Anderson, Mulholland & Associates, Inc. collected surface and subsurface soil samples at 25 and 30 SWMUs/AOCs/areas, respectively, in multiple phases from 1998 to 2002, as part of the RFI activities. The laboratory analyzed the samples for VOCs, BNAs, and/or metals. Section 3 presents the findings.

2.8 Interim Actions

2.8.1 Old Oil Lagoons Excavations

In response to the soil data gathered in SWMU 11 (Old Oil Lagoons), an Interim Corrective Measure (ICM) was implemented in December 2006. The ICM involved excavation of impacted soil from within the old oil lagoons and off-site disposal as non-hazardous waste. Soil was excavated until constituent concentrations were below USEPA Industrial Soil Ingestion Regional Screening Levels (RSLs) (Anderson, Mulholland & Associates 2009b). Confirmatory sampling revealed that concentrations in soil were still above the Protection of Groundwater RSLs (USEPA 2008).

2.8.2 Free Product Recovery

As discussed in Section 2.7.1, prior to the 2009 explosion and fires, ongoing interim measure activities were conducted in association with the underground free product recovery system.

Twenty-two of the product recovery wells were automated (pneumatically operated recovery wells to continuously remove free product). About 38 were either bailed or emptied with a vacuum truck periodically to remove free product. An estimated 80,000 gallons of product were removed from the subsurface at the rate of a few hundred gallons per month between 1991 and 2009 (ARCADIS Puerto Rico 2011a).

2.8.3 Soil and Product Recovery in Response to 2009 Incident

Immediately following the 2009 explosion and fires, the USEPA began recovering free product and contaminated soil from various areas at the Facility that were impacted by the incident. Response actions are documented in the USEPA Pollution Reports for the CAPECO Facility. This is further discussed in Section 3.2.

2.9 3008(h) Administrative Order

As mentioned above, the former refinery was the subject of an Order issued by the USEPA in 1995 pursuant to Section 3008(h) of RCRA (the 1995 RCRA Order). This Order required the refinery facility to perform the following seven tasks:

- Perform a systematic investigation of specific SWMUs and AOCs, and summarize the results of the investigation in a RFI report

- Prepare a corrective measures report to evaluate alternatives for corrective measures, and to serve as the basis for the USEPA to select a remedy for the Facility

- Perform an assessment of the process sewer system that collected process wastes in the refinery area

- Perform an assessment of Las Lajas Creek to identify hazardous wastes and/or hazardous constituents released to the creek, and to characterize the hydrology of the creek and surrounding groundwater

- Implement interim measures to consist of continuing to operate the free product recovery and groundwater monitoring systems in place at the Facility

- Notify the USEPA of new releases of hazardous wastes or hazardous constituents, or discovery of other SWMUs at the Facility

- Notify the USEPA of plans to take expedited steps to respond to releases under certain conditions

CPR had completed most of the work required under the 1995 RCRA Order by October 2009, as may be found in historical reports. The systematic investigation of SWMUs and AOCs was essentially complete, although a comprehensive RFI report had not yet been prepared. The extent to which these data remain valid is however uncertain due to the potential change of conditions from the October 2009 explosion and fire. While a substantial amount of the work required under the 1995 RCRA Order was performed prior to the 2009 explosion, more data are required to confirm that subsurface conditions have not changed.

The explosion and fire in October 2009 damaged or destroyed about half of the tanks at the terminal, and many monitoring and recovery wells. The subsurface free product recovery system was also destroyed during the incident. A comprehensive investigation of the impact of releases from the explosions on current environmental conditions at the Facility has not yet been performed. It is not anticipated that the subsurface conditions were altered as a result of the fires due to the confining nature of the underlying lithology, but investigations must be completed to confirm that subsurface conditions were not altered as a result of the 2009 incident.

2.10 EI Assessment

2.10.1 Human Exposure

The EI for Current Human Exposure was finalized by the USEPA in 2004, and is provided in **Appendix C**. The results of the EI indicated that current human exposure was under control. However, in a December 29, 2010 memorandum, the USEPA determined that the conclusions set forth in the EI assessment were no longer valid, based on the new environmental conditions present at the Facility as a result of the 2009 incident.

2.10.2 Migration of Contaminated Groundwater

The EI for Migration of Contaminated Groundwater was finalized by the USEPA in 2008, and is provided in **Appendix C**. The results of the EI indicated that the migration of contaminated groundwater had stabilized, and that monitoring would be conducted to confirm that additional migration does not occur. The EI states that an ecological receptor evaluation was intended to be developed in the future.

Changes in the Facility status have not occurred since the approval of the EIs, and additional operations have not taken place, with the exception of the October 2009 explosion and fire. In the December 2010 memorandum mentioned above, the USEPA retracted their approval of the positive EI assessment for Migration of Contaminated Groundwater under Control, due to the uncertain environmental conditions present at the Facility as a result of the 2009 incident.

Based on the stable nature of the free product, as controlled by the lithology in the area, subsurface conditions probably have not changed significantly with respect to migration of free product on the water table. A revised EI assessment will be conducted by the USEPA after current data are obtained for the Facility.

3. Current Conditions

The nature and extent of contamination have not been completely delineated in any medium at the Facility since the October 2009 explosion and fire. Descriptions of the various media of concern and related constituents based on historical investigations follow.

3.1 Nature and Extent of Contamination

3.1.1 Groundwater

3.1.1.1 Historical

As mentioned in Section 2.7, various monitoring wells have been sampled for select constituents (depending on what area of the Facility they are located) over history. A summary of the historical conditions and potential constituents of concern are discussed below, based on the 2004 Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004) and the most recent semiannual groundwater sampling event (September 2009), and as concluded in the 2008 EI documentation . Concentrations were historically compared to USEPA Industrial Risk-based Screening Levels (RBSLs) and MCLs, but for the purposes of this CCR, concentrations have been re-evaluated and compared to the most recent (November 2011) USEPA Region III Tapwater RSLs, with exceptions noted below. MCLs were used for comparison where RSLs are not established. The following historical information is documented for groundwater:

- Petroleum hydrocarbons are present in the upper clayey sediment (Zone A) and carbonate sediment (Zone B) water-bearing zones in the form of LNAPL. **Figure 6** presents the known locations (pre-fire) of the LNAPL plumes. There were reportedly five plumes, generally within the tank farm and WWTP areas. Previous investigations conclude that the LNAPL plumes were stable with negligible migration through September 2009.

- Analytical results from groundwater sampling conducted in 2003, and reported in the 2004 Groundwater Monitoring Report (Anderson, Mulholland & Associates, Inc. 2004) exhibited concentrations of various constituents above their respective screening criteria. The sitewide groundwater investigation determined that groundwater in the shallow (Zone A) and deep (Zone B) zones were impacted by various historical onsite activities. However, it was also concluded that migration of contaminated groundwater appeared to be stabilized, no evidence of impact was present offsite, and there was no indication that the impact to groundwater resulted in unacceptable risk to human health (Anderson, Mulholland & Associates, Inc. 2004). Due to the extensive amount of data included in the 2004 report, data were not re-evaluated respective to the current RSLs for this CCR. The tables and figures from the 2004 report are included as **Appendix G** for reference. Concentrations were compared to RBSLs and MCLs at the time. The aerial extent

of impacted groundwater exceeding screening levels (2004 RBSLs and MCLs) is presented on Figures 6-1, 6-2 and 6-3 of **Appendix G**. The following conclusions were made in the 2004 report:

- Process Sewer Area: An area of impacted groundwater was identified in Zone A, underlying the southern portion of the Facility's former process sewer system. The following VOCs and BNAs were detected above 2004 screening levels: benzene, 1,2-Dichloroethane (1,2-DCA), 2-methylnaphthalene and naphthalene. Total arsenic and lead were also detected above screening levels, but dissolved concentrations were not above screening levels. With the exception of 1,2-DCA, the constituents detected were consistent with those expected to be found in a petroleum refinery process sewer.
- Old Loading Rack: Groundwater in Zone A in this area was impacted with benzene, naphthalene, and total and dissolved arsenic. The loading rack was removed in 1976, and was not considered a continuous source of impact.
- Wastewater Treatment Plant Area: Several VOCs and BNAs were detected above screening levels in Zone A in this area: benzene, 2-methylnaphthalene, naphthalene, chrysene, fluorene and bis(2-ethylhexyl)phthalate (BEHP; likely a laboratory contaminant per the 2004 report). Several total metals were above screening levels (arsenic, barium, beryllium, chromium, lead and vanadium), but dissolved concentrations were below screening levels. This impact was suspected to be related to reported releases from the underground piping in the area. The piping was repaired or replaced.
- Old Oil Lagoons: Zone A in this area contained exceedances of benzene, naphthalene, benzo(a)pyrene, and total and dissolved arsenic. The source was presumed to be historical releases from the oil lagoons. The lagoons were closed in 1980. At closure, materials were removed and placed in an approved offsite landfill. Closure was approved by the Puerto Rico Environmental Quality Board.
- Sulfur Lagoon: No VOCs or BNAs were detected above screening levels in this area. Total metals concentrations of arsenic, chromium and vanadium were above screening levels in Zone A, but dissolved concentrations were not above screening levels.
- Northeast Facility Area: TCE and its degradation products (vinyl chloride [VC] and cis-1,2-dichloroethene [cis-,1,2-DCE]) were detected in Zone B at least once at concentrations above screening levels in this area. The presence of TCE was attributable to offsite sources (Anderson, Mulholland & Associates, Inc. 2004). The USEPA is conducting an ongoing investigation related to the Fort Buchanan property that is the source of this plume. A presentation on the Fort Buchanan northwest boundary investigation is included in **Appendix F**.
- Arsenic in Zone B: An arsenic plume with levels above the MCL of 10 µg/L was found to occur in Zone B in the northern tank farm area. The highest arsenic level within the plume was present at MW-85B2 (69 µg/L). Arsenic was not detected above screening levels in Zone A overlying the plume, and was confined to the onsite Facility wells. The source of the arsenic was not determined.
- MTBE was detected in 27 of 42 groundwater samples analyzed for VOCs. MTBE was only detected above the acceptable drinking water guidelines at the time (20 to 40 µg/L; established by USEPA in the 1997 Drinking Water Advisory) in one well (B-2 at an estimated concentration of 517 µg/L). Several concentrations were present in exceedance of the current RSL (12 µg/L), including well MW-15A which is located adjacent to Outfall 002.

  - There were also isolated/anomalous detections in some wells that needed to be confirmed because concentrations were only above MCLs during one sample round (e.g. VC in MW-83B1, cis-1,2-DCE in MW-75B, benzene and naphthalene in MW-13A, arsenic in MW-41A). A summary of proposed supplemented activities to delineate/confirm the findings of the 2003 investigations are presented in Table 6-1 of **Appendix G**. Delineation work will be implemented as applicable, and the wells/constituents of concern be re-evaluated during future investigations and compared to current RSLs/MCLs.

- The dissolved lead concentration in a groundwater sample collected from monitoring well MW-37A during the March 2008 sampling event exceeded the USEPA drinking water MCL. This is the only dissolved lead exceedance detected at this well since it was added to the monitoring program in 1992. Prior to this detection, an MCL exceedance of dissolved lead in groundwater was not detected since September 1997 (in well MW-76B). Total lead detections in 2003 are not believed to represent true groundwater conditions.

- Historically, dissolved mercury has been detected at concentrations above USEPA Tapwater RSLs along the northern boundary of the Facility.

- During the March/April 2008 sampling event, well MW-30B (located in the west-central part of the Facility) contained 1,2-dichloropropane at a concentration above the Tapwater RSL, consistent with historical results. Additional wells were subsequently sampled for 1,2-dichloropropane in order to delineate the plume. Any downgradient well did not show concentrations of this constituent, and its potential presence at well MW-30B appears to be localized. There are no buildings in the area of MW-30B, and the potential for vapor intrusion is therefore not a concern. If evaluation of data or proposed future land use reveals that there is a potential vapor intrusion issue, PUMA will conduct a vapor intrusion assessment.

- BTEX: Benzene and ethylbenzene have historically been detected at concentrations above Tapwater RSLs in several wells. However, since 2005, the only concentration above the RSL in the semiannual sampling network was 0.5J µg/L of benzene in September 2009 (MW-14B). Additionally, among the wells in the semiannual sampling network, toluene and total xylenes have only been historically detected above RSLs in MW-37A, but have not been detected above RSLs since 1995 and 1998, respectively. MW-14B and MW-37A are located downgradient from the LNAPL plumes. BTEX concentrations are likely from dissolution of the plumes with subsequent downgradient transport.

- Concentrations of chlorinated VOCs, including TCE, tetrachloroethene (PCE), cis-1,2-DCE, trans-1,2-DCE and VC have been historically detected in monitoring wells located along the Facility's eastern boundary. Recently detected concentrations of TCE, PCE and VC exceed their respective Tapwater RSLs. Among the wells sampled, detected concentrations of trans-1,2-DCE have not exceeded its respective Tapwater RSLs. Detections of cis-1,2-DCE have not exceeded its respective Tapwater RSL since March 2004. As discussed in Section 2.3, this plume is considered part of a larger plume originating from the Fort Buchanan property, located east of the Facility. Fort Buchanan was in the process of identifying the source, and evaluating the need for remedial actions for this plume as concluded in the 2008 EI. PUMA does not have monitoring wells along the southern boundary of the Facility to assess the upgradient (background) concentrations potentially associated with the Fort Buchanan plume (USEPA 2008). Fort Buchanan was not impacted by the 2009 incident, and therefore the conclusions set forth in the 2008 EI related to this plume should remain valid.

Anderson, Mulholland and Associates, Inc. conducted four rounds of groundwater sampling between July 2006 and December 2007 as part of the RFI's SGMP. The objective of the investigation was to delineate the extent of mercury and chlorinated hydrocarbon concentrations based on previous contaminant levels in select wells. Anderson, Mulholland and Associates, Inc. sampled 14 wells for mercury and four wells for the chlorinated hydrocarbons of concern. The technical memorandum that presented the results (Anderson, Mulholland & Associates 2008) also presented historical data of these constituents for reference. **Table 1** presents the historical mercury concentrations in monitoring wells from March 1996 through December 2007. **Table 2** presents the historical concentrations of VOC constituents of concern in the four wells of concern from March 1996 through December 2007.

The semiannual groundwater sampling associated with the underground recovery system focused on VOCs/BNAs and select dissolved metals. Constituents of concern have historically been chlorinated hydrocarbons (TCE, PCE, VC, and cis/trans-1,2-DCE), mercury, arsenic, and lead, although some of these have not been detected above their respective Tapwater RSLs for several years, or are only detected in isolated areas. BTEX have also been historically detected at isolated locations, but recent concentrations have not exceeded their respective RSLs. Arsenic is only analyzed for in groundwater due to historical soil detections of arsenic in select areas of the Facility.

As discussed above, the last semiannual groundwater sampling event associated with the underground recovery system was conducted in September 2009. **Table 3** presents the analytical results for this event. The report summarizing the 2009 results (Anderson, Mulholland & Associates 2009c) also provides historical BTEX and dissolved lead concentrations in the well network. **Table 4** presents these results.

Results of the September 2009 sampling event indicated that benzene, 1,2-dichloropropane, TCE, PCE and VC exceeded their respective USEPA Tapwater RSLs in isolated locations. The single benzene and 1,2-dichloropropane exceedances were qualified as estimated concentrations by the laboratory. Benzene had not previously been detected in this location (MW-14B) since September 2005. TCE, PCE and VC are not petroleum-related VOCs, and their presence (in MW-75B) is not attributed to Facility activities (Anderson, Mulholland & Associates 2009c). This dissolved-phase chlorinated VOC plume is considered part of a larger plume originating from the Fort Buchanan property, located east and upgradient of the Facility (USEPA 2008). Concentrations of cis-1,2-DCE and trans-1,2-DCE were also detected in MW-75B; however these concentrations were an order-of-magnitude lower than their respective Tapwater RSLs. Dissolved metals were not detected above method detection limits in any wells (**Table 3**).

3.1.1.2 Recent

The October 2009 explosion and fire, as well as the associated response activities, damaged or destroyed many of the monitoring and recovery wells at the Facility. PUMA conducted a well survey in September 2011 to assess the condition of these wells. **Table 5** presents the current conditions of the wells based on the survey. **Table 5** also presents current LNAPL thicknesses that were able to be measured. Groundwater sampling has not been conducted since the fires. The tanks that released product contained petroleum products. The fires would not have released any new contaminant that was not previously present on the Facility, but current concentration levels are unknown.

3.1.2 Surface Water

Two shallow low-flow creeks are present at the Facility. Las Lajas Creek is channeled underground as it enters the Facility and returns to an open channel north of the Facility's WWTP area. Much of the flow is outfall discharge once Las Lajas Creek has passed through the Facility. The Diego Creek traverses through the northwest portion of the property.

Groundwater discharge from the overburden water-bearing zone to Las Lajas Creek has been indicated in previous assessments. Groundwater sampling was therefore historically conducted from shallow wells nearby and adjacent to the creek (MP-1, MP-5A, MP-9, MP-10, MW-86A, MW-110A and MW-111A) to demonstrate surface water EIs. In 2009, CPR developed a work plan for surface water sampling at Las Lajas Creek, to assess potential impacts to surface water from groundwater. The work plan was pending final USEPA approval when the October 2009 incident took place. The proposed surface water sampling in Las Lajas Creek has not been conducted.

LNAPL plumes have not occurred adjacent to the creek, and impacts to surface water from the LNAPL plumes have not been previously indicated (USEPA 2008).

However, the presence of residual contamination in Las Lajas Creek and the Diego Creek as a result of the 2009 explosion and fire has not been fully assessed. While there were visual impacts observed in Las Lajas Creek and the wetland area following the 2009 incident, subsequent assessments of the area in 2011 did not indicate residual impacts. The latest visual assessment of this area, as part of the removal action conducted by the USEPA and subsequently by PUMA, has not identified the presence of residual hydrocarbons. ARCADIS Puerto Rico evaluated Las Lajas creek in September 2011 as part of the Hydrogeomorphic Functional Assessment of the wetlands at the Facility (ARCADIS Puerto Rico 2011c). The 2011 assessment report is provided as **Appendix D**. The assessment did not find residual oil in the wetland or creeks. Indications of residual oil (e.g., petroleum-like odors, sheens, surface staining, or discoloration) were not observed on standing vegetation, soil profiles, or surface waters.

As discussed in Section 2.2.4, the USEPA, under Nationwide Permit 20, constructed a gabion retaining wall and earthen berm containing a flow control structure (underflow dam) across Las Lajas Creek as part of the October 2009 fire management activities to help restrict potential downgradient migration of released petroleum product, These water control structures have restricted the hydrologic connection with the downgradient portion of Las Lajas Creek. They remain in-place and will be evaluated as part of the facility-wide corrective action.

3.1.3 Sediment

Anderson, Mulholland and Associates, Inc. collected sediment samples at nine locations in the creek, upstream and within the Facility boundary, as part of the Las Lajas Creek Human Health Assessment in June 2002. Anderson, Mulholland and

Associates, Inc. additionally collected bank soil samples at three locations north of the Facility's WWTP. The laboratory analyzed the samples for VOCs, BNAs, polychlorinated biphenyls (PCBs), and metals (Anderson, Mulholland & Associates 2003b).

Constituent concentrations in the sediment and bank soil samples were historically compared to human health RBSLs for ingestion and migration to groundwater. For the ingestion pathway, detected concentrations were compared to USEPA Region III risk-based concentrations for an industrial exposure. For the migration to groundwater pathway, detected concentrations were compared to USEPA Soil Screening Levels (SSLs) as presented in USEPA's Soil Screening Guidance. SSLs based on a dilution-attenuation factor (DAF) of 20 were used, due to the limited areal extent of sediment in the Creek and the bank of the Creek. Metal concentrations were also compared to background levels determined during the RFI investigation for the CPR facility. The Creek sediment and bank soil sample results and RBSLs/SSLs that were used for comparison are presented on **Table 6**. Sample locations are depicted on Figures 1 through 7 of the Las Lajas Creek Assessment-Supplemental Bank and Sediment Sampling Report (Anderson, Mulholland & Associates 2003b).

Results from the sediment samples indicated that constituents were not detected above RBSLs, except for arsenic and chromium. Arsenic was the only constituent above the soil ingestion RBSL. Arsenic was considered delineated, as it did not exceed background levels at the two most downstream locations.

Results from bank soil samples also indicated that constituents were not detected above RBSLs, except for arsenic and chromium. Chromium exceeded its background concentrations, but arsenic did not. The potential impact of chromium on groundwater was proposed to be addressed as part of the CPR's SGMP. Current (post-fire) sediment and bank soil conditions in the creek are unknown.

3.1.4 Wetlands

ARCADIS Puerto Rico conducted a Hydrogeomorphic Functional Assessment on the wetland that is situated in the northern 64 acres of the Facility in September 2011 (ARCADIS Puerto Rico 2011c). The assessment concluded that:

- Surface and subsurface water storage performance is currently reduced, which is likely due to the lack of organic material in the surface soil layer, as a result of the

October 2009 fires. It is expected that the organic layer will be replenished over time.

- Nutrient cycling performance is good due to the presence of shrub stratum, and is expected to further improve with the replenishment of the organic layer.

- The performance of organic carbon export is currently low due to the absence of organic material and the presence of the water control structures (underflow damn), which limits the hydrologic connection with the downstream portion of Las Lajas Creek. The water control structures in the wetland significantly limit the migration of dissolved and particulate organic carbon. Removal of the water control structures would likely improve the functional performance of the wetland.

- The plant and habitat communities are in good condition, and are expected to further improve as the organic layer is replenished.

- Residual oil or related indicators (odors, sheens, and staining) were not found in the vegetation, soil, or surface waters.

Appendix D includes a copy of the Hydrogeomorphic Functional Assessment Report. Analytical samples have not been collected in the wetlands, and current constituent concentrations in the wetlands are unknown.

3.1.5 Soil

3.1.5.1 Surface Soil

Surface soil samples (less than two feet below ground surface [bgs]) were collected at 25 SWMUs/AOCs/areas during multiple investigations, as part of the RFI activities. The laboratory analyzed the samples for VOCs, BNAs, and/or metals. Arsenic concentrations in exceedance of the RSLs for Industrial Soil and Protection of Groundwater were detected at 25 SWMUs/AOCs, with levels ranging up to 93.2 mg/kg. Arsenic also exceeded its background level at 15 SWMUs/AOCs. **Table 7** shows the maximum detected arsenic concentrations that exceed the surface soil screening level at the SWMUs/AOCs/areas during the investigations (USEPA 2004). The 2004 EI (the source of these data [USEPA 2004]), did not depict concentration values that were below the RBSL at the time (1.9 mg/kg). Only concentrations above the RBSLs were shown (see **Table 7**). Because constituent concentrations were not provided, it is

unknown if these values are above the most current, more stringent RSL (1.6 mg/kg) or the Protection of Groundwater RSL (0.0013 mg/kg).

No other constituents were detected at concentrations above RBSLs at the time. Current (post-fire) surface soil concentrations are unknown.

3.1.5.2 Subsurface Soil

Subsurface soil (greater than two feet bgs) samples were collected at 31 SWMUs/AOCs/areas during multiple investigations, as part of the RFI activities. The laboratory analyzed the samples for VOCs, BNAs, and/or metals. Exceedances of the RSLs for Industrial Soil or Protection of Groundwater were detected at 30 SWMUs/AOCs. Parameters exceeding their respective RSLs include arsenic, vanadium, benzo(a)anthracene, and benzo(a)pyrene. Arsenic exceeded its Industrial Soil and Protection of Groundwater RSLs at 30 SWMUs/AOCs/areas, with concentrations ranging up to 138 mg/kg. Arsenic also exceeded its background level at 18 SWMUs/AOCs/areas. Vanadium exceeded its Protection of Groundwater RSL and background level only at SWMU 34. Benzo(a)anthracene exceeded its Industrial Soil and Protection of Groundwater RSLs only at SWMU 11. Benzo(a)pyrene exceeded its Industrial Soil and Protection of Groundwater RSLs only at SWMUs 3 and 11. Contaminated soils in SWMU 11 were later excavated, as discussed in Section 2.7.3. **Table 8** presents the maximum detected concentrations that exceeded subsurface soil screening levels at the SWMUS/AOCs/areas during the investigations (USEPA 2004). The source of these data (USEPA 2004) did not show concentration values that were below the Industrial Soil RBSLs at the time. Because constituent concentrations were not provided, it is unknown if these values are above the most current Industrial Soil RSLs or Protection of Groundwater RSLs.

3.2 Status of Tanks

The CAPECO tank farm consisted of 42 aboveground fuel storage tanks at the time of the explosion and fire. Tanks that were impacted by releases associated with the 2009 incident are depicted on Figure H-1 in **Appendix H**. Areas specifically impacted by the 2009 incident include:

- Northern Tank Farm
- Vicinity of WWTP

- Storm water channels

The USEPA has dismantled 20 tanks since the fire (see tank footprints on **Figure 2**). PUMA is currently evaluating nine tanks for refurbishment, and five tanks for demolition. The fire damaged three of the fourteen tanks. These do not include the LPG bullet tanks since PUMA is evaluating what they will do with them. The other tanks are part of the upcoming demolition project. The fuel transfer pipeline from the PUMA dock to the terminal is also currently being refurbished in some areas, and replaced in areas where it was destroyed by the fire.

Table 9 and **Table 10** provide a summary of areas where cleanup activities have been conducted at the Facility by the USEPA, CAPECO and PUMA, and what contaminated media have been disposed of offsite, respectively. USEPA disposal information was obtained from the USEPA Pollution Reports. Figure H-2, included in **Appendix H**, depicts the areas that have been addressed.

3.3 Status of Refinery

The refinery is no longer in use and will be demolished by PUMA in accordance with the requirements of the "Agreement and Order of Consent for Demolition" (CERCLA-02-2011-2003) between EPA and PUMA in May 2011. Work plans have been submitted to and approved by EPA and the demolition activities began in February 2012. The work plan addresses all structures above ground surface as well as residual asbestos on surface soils. Any residual contamination discovered as part of or after completion of the demolition will be addressed under the 3008(h) Order.

4. Current Activities and Development Plans

Various parts of the Facility are under construction, and statuses are continuously changing. **Appendix E** presents a photographic log of Facility structures and features as of September 30, 2011.

4.1 Construction Activities

PUMA is currently continuing to address the remaining aboveground storage tanks and associated equipment that were damaged or destroyed as a result of the 2009 explosion and fire. The following activities have been completed or are currently taking place at the Facility:

- PUMA has continued the tank cleaning and scrap storage that the USEPA began implementing after the 2009 fires. The majority of the tanks at the Facility will be dismantled. **Figure 2** shows scrap metal storage and soil stockpile areas.

- PUMA is evaluating the remaining tanks for refurbishing (Tank numbers 101 through 106, 201 through 203, 501, 502, 601, 602, and 604), located on the southeastern portion of the Facility.

- On-site pipelines have been drained, cleaned and removed. Additionally, the fuel transfer pipeline and its components (saddles, supports, and valves) from the loading dock are undergoing refurbishment.

- Construction of a new storage tank 603 will take place in the area north of current tank 604.

PUMA's plans to redevelop the Facility will take place in a three phased approach, with the goal of creating a state-of-the art bulk fuel storage terminal. The phases of construction are: Phase I - reconstruction and demolition, which includes environmental assessment and demolition of the existing refinery, control and warehouse buildings of the Facility; Phase II - construction of the tank farm to increase storage capacity to 1.39 million barrels; and Phase III - potential expansion to five-million barrels capacity. **Figure 7** shows these phases.

Most of the individual SWMUs and AOCs identified in the 1995 RCRA Order will be excavated and removed. These will essentially disappear with construction/removal activities.

4.2 Waste Management

There are currently only two listed hazardous wastes managed at the Facility's WWTP: F037 and K051 wastes. Non-hazardous wastes generated as part of the tank cleaning and other redevelopment activities are stored in the designated staging areas, where these are sampled for characterization and transported for off-site disposal. Scrap metal from tank and pipe dismantling is also stored in the designated scrap storage areas.

5. Data Gaps

There are currently several data gaps that have been identified during post-fire assessments. Additional areas at the Facility need to be studied to assess the possibility and magnitude of contamination from releases that occurred as a result of the 2009 fires while the majority of the RFI was completed as per the RCRA Order. We have summarized these below:

- Extent of groundwater contamination: It is unknown if the fires affected the groundwater quality at the Facility.

- Extent of soil contamination: It is unknown if releases from the fires resulted in additional soil contaminants.

- Extent of LNAPL plumes: It is not anticipated that the 2009 fires changed underlying conditions. The underground LNAPL recovery system was however destroyed as a result of the fires.

- Potential impacts to Las Lajas Creek and the wetlands: The creek and wetland are located downgradient of the origin of the fires, and it is unknown if run-off traveled to these areas. The wetland assessment conducted by ARCADIS Puerto Rico in September 2011 did not find indications of residual product, but the current analytical concentrations in the soils, sediments, and surface waters of the wetlands and creeks are unknown.

6. Work Recommendations

As mentioned above, construction/excavation activities will take place in a phased approach following the initial post-fire response activities in order to re-structure the Facility appropriately as a bulk fuel storage terminal. As construction and development activities continue, additional interim removal activities may be proposed at any time as per the RCRA Order.

Most of the individual SWMUs and AOCs identified in the 1995 RCRA Order will be excavated or removed, and will essentially disappear with construction activities. Revised SWMUs and AOCs that are more applicable to the current conditions of the Facility will be identified based on the findings of the proposed environmental assessments discussed below. In addition to the phased construction activities, the

following general activities are recommended to assess the current environmental conditions at the Facility:

- Delineate groundwater contamination
  - PUMA will evaluate all current monitoring and recovery wells at the Facility that were damaged or destroyed in the 2009 fires. PUMA will also evaluate wells that were not impacted (because historical information on the construction and screened intervals of the wells is limited) to determine if they are of acceptable quality.
  - PUMA will install replacement wells once the survey is complete in accordance with the construction schedule of the new tanks and buildings.
  - In addition, PUMA will install additional wells along the southern and eastern borders of the Facility in order to establish background levels that are potentially migrating from upgradient and side-gradient sources. This task will include the replacement of any damaged well in the northern part of the Facility.
  - PUMA will initiate a site-wide groundwater sampling event after the wells have been installed to establish baseline concentrations. Samples will be analyzed for the same parameters as previously analyzed for/detected (VOCs +MTBE, BNAs and dissolved mercury, lead, chromium and arsenic). The sample analytes list will be reduced as necessary once contaminant levels are identified to focus on potential constituents of concern. Routine sampling will commence, and new wells will be added to the well network, as necessary, in accordance with PUMA's construction phases.
- Delineate soil contamination
  - PUMA will collect surface soil samples in the areas where soil removal activities will take place due to cleaning and or expansions, in accordance with the final design of the Facility, in order to assess current surface soil conditions. Subsurface samples will be collected in the affected areas if surface contamination is noted. Analytes will consist of the same analytes as historically detected, depending on the area.
  - Geotechnical soil borings may be collected to establish ground stability information as part of the construction activities. Environmental sampling for laboratory analyses will be performed in conjunction with this. Details regarding what samples will be collected, and what parameters will be analyzed for, will be presented in a work plan. The number of delineation borings will be determined based on hot spots that are identified during the field activities.
  - Delineate LNAPL plume
  - This will be completed in conjunction with groundwater sampling and soil boring activities. LNAPL thicknesses will be gauged routinely and in accordance with the construction project phases once the new wells are installed.
  - The LNAPL recovery system will also be reconstructed, and recovery activities will commence as soon as practicable in accordance with the construction project phases.
- Delineate potential impacts to Las Lajas Creek and the wetlands
  - Sediment and surface water samples will be collected in the creek

  - Sediment and surface water samples will be collected in the wetlands
  - The water control structures (underflow damn) that are currently installed in the wetlands will be removed. These structures significantly limit the hydrologic connection with the downstream portions of Las Lajas Creek, and limit the downgradient migration of dissolved and particulate organic carbon. The functional performance of the wetland will likely increase with removal of the damn.

- All media will be analyzed for VOCs +MTBE, BNAs, lead, chromium, mercury and arsenic. Soil data will be compared to the most recent USEPA Industrial RSLs (onsite data), Residential RSLs (offsite data) and Protection of Groundwater RSLs (onsite and offsite). Sediment sample data will be compared to the applicable sediment screening benchmarks. Onsite and offsite groundwater data will be compared to USEPA Tapwater RSLs. MCLs and MCL-based SSLs will be used for comparison where RSLs are not available. Following data evaluation, it will be determined if a Human Health and/or Ecological Risk Assessment is warranted for the proposed future use of the property.

- If evaluation of data reveals that there is a potential vapor intrusion issue, PUMA will conduct a vapor intrusion assessment.

PUMA will submit a work plan outlining the details associated with the implementation of these investigations upon USEPA approval of these proposed activities. As activities continue, additional interim activities may be proposed at any time as per the RCRA Order.

Upon completion of investigative activities, the most recent sample data will be used to conduct revised EI assessments for “Current Human Exposures” and “Migration of Contaminated Groundwater”.

7. References

A.T. Kearney, Inc. and Harding Lawson Associates. 1989. RCRA Facility Assessment Preliminary Review/Visual Site Inspection, Caribbean Gulf Refining Corporation, Bayamon Bayamón, Puerto Rico. March 1989.

Anderson, Mulholland & Associates, Inc. 2000a. Technical Memorandum: RCRA Facility Investigation, Phase I Wastewater Treatment Plant Soil. July 2000.

Anderson, Mulholland & Associates, Inc, 2000b. Technical Memorandum: RCRA Facility Investigation, Phase II Wastewater Treatment Plant Soil. July 2000.

Anderson, Mulholland & Associates, Inc. 2000c. Technical Memorandum: RCRA Facility Investigation, Phase IA Soil Investigation Results. July 2000.

Anderson, Mulholland & Associates, Inc. 2001a. RCRA Facility Investigation Dye Tracer Testing Program: Report on Preliminary Activities. August 2001.

Anderson, Mulholland & Associates, Inc. 2001b. RCRA Facility Investigation Dye Tracer Testing Program: Geological Evaluation. October 2001.

Anderson, Mulholland & Associates, Inc. 2001c. Technical Memorandum: RCRA Facility Investigation, Phase IB and 2A Soil Investigation Results. August 2001.

Anderson, Mulholland & Associates, Inc. 2002. Technical Memorandum: RCRA Facility Investigation, Phase 3 Soil Investigation Results. September 2002.

Anderson, Mulholland & Associates, Inc. 2003a. Phase II Process Sewer Assessment Report. Revised April 2003.

Anderson, Mulholland & Associates, Inc. 2003b. Las Lajas Creek Assessment, Supplemental Bank and sediment Sampling Report (Human Health Assessment), Revision 1. August 2003.

Anderson, Mulholland & Associates, Inc. 2004. Sitewide Groundwater Monitoring Program, Draft Final Report. January 2004.

Anderson, Mulholland & Associates, Inc. 2008. Technical Memorandum: Groundwater Sampling for Mercury and TCE, Evaluation of Results from Four Sampling Rounds between July 2006 and December 2007, Site-wide Groundwater Monitoring Program. June 2008.

Anderson, Mulholland & Associates, Inc. 2009a. Former Equalization Basin 2009 Annual RCRA Groundwater Monitoring Report. May 2009.

Anderson, Mulholland & Associates, Inc. 2009b. Interim Corrective Measure Implementation Report, Old Oil Lagoons. Caribbean Petroleum Corporation Refinery/Terminal, Bayamón, Puerto Rico. February 2009.

Anderson, Mulholland & Associates, Inc. 2009c. Groundwater Quality Sampling Results, Underground Recovery System. September 2009.

ARCADIS Puerto Rico. 2011a. Phase I Environmental Site Assessment, Caribbean Petroleum Corporation Refinery/Terminal, Bayamón, Puerto Rico. May 9, 2011.

ARCADIS Puerto Rico. 2011b. Work Plan, Former Caribbean Petroleum Corporation Refinery/Terminal, Bayamon, Puerto Rico, Agreement and Order on Consent for Removal Actions, Docket No. CWA-02-2011-3021. July 5, 2011.

ARCADIS Puerto Rico. 2011c. Hydrogeomorphic Functional Assessment Report, Former Caribbean Petroleum Corporation Refinery/Terminal, Bayamón, Puerto Rico. October 27, 2011.

Geraghty and Miller. 1988. Hydrogeologic Assessment at the CARECO Refinery. November 1988. Revised February 1989.

Malot. 1985. Phase II Subsurface Product Recovery Project, Caribbean Gulf Refining Corporation. September 1985.

Malot. 1986. Environmental Screening Study, Gulf/Chevron Refinery. July, 21, 1986.

Radian Corporation. 1990. Liquid Phase Hydrocarbon Recovery System Evaluation, Caribbean Petroleum Corporation. August 1990.

SCS Engineers. 2010. Evaluation of Environmental Liabilities, Caribbean Petroleum Refining, LP and Caribbean Petroleum Corporation. December 6, 2010.

USEPA. 2004. Documentation of Environmental Indicator Determination. Current Human Exposures under Control. September 2004.

USEPA. 2008. Documentation of Environmental Indicator Determination. Migration of Contaminated Groundwater under Control. September 2008.

USEPA. Gulf Refinery Pollution Reports. Retrieved from http://www.epaosc.org/site/sitrep_list.aspx?site_id=5524.

USEPA. Fort Buchanan Pass-Through Oil Release. Pollution Report #16. Special #6-Sigficant Discharge of Oil/Grease into Fort Buchanan. Retrieved from http://www.epaosc.org/site/sitrep_profile.aspx?site_id=6672.

USEPA. Envirofacts Warehouse Facility Detail Report for Caribbean Petroleum Refining. Retrieved from http://iaspub.epa.gov/enviro/fii_query_dtl.disp_program_facility?p_registry_id=110008471956.

USEPA. Puerto Rico RCRA Cleanup Site Fact Sheets: Caribbean Petroleum Refining Limited Partnership. Retrieved from http://www.epa.gov/region2/waste/fscpr.htm.

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Date	Well No.	Concrete Base	Steel Security Casing	Frozen	Anderson Mulholland & Assoc. November 2009 Report Product Thickness	Water Label	Well Depth	Free Product	Observations
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Date	Well No.	Concrete Base	Steel Security Casing	Frozen	Anderson Mulholland & Assoc. November 2009 Report Product Thickness	Water Label	Well Depth	Free Product	Observations
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Date	Well No.	Concrete Base	Steel Security Casing	Frozen	Anderson Mulholland & Assoc. November 2009 Report Product Thickness	Water Label	Well Depth	Free Product	Observations
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Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Volatile Organic Compound Concentrations																				
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	0	0							0											
	000	0							0											
	0 09	9 0												0						

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Base Neutral/Acid Extractable Compounds																				
				999	999	999	999	999	999	999		999	999							
	0	0		0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0	0		0	00	0	0	0	0	0		0	0							
	00	000		0	00	0	0	0	0	0		0	0							
	00	000		0	00	0	0	0	0	0		0	0							
	000	9 000		0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	00	0		0	00	0	0	0	0	0		0	0							
	0	0			00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0	9 0		0	00	0	0	0	0	0		0	0							
	9 0	00		0	00	0	0	0	0	0		0	0							
	0			0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0			0	00	0	0	0	0	0		0	0							
	0 0	000		0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0	0		0	00	0	0	0	00	00		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
	0			0	00	0	0	0	0	0		0	0							
	0 0	0		0	00	0	0	0	0	0		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
	0			0	00	0	0	0	0	0		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
	000			0	00	0	0	0	0	0		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
	09	0		0	00	0	0	0	0	0		0	0							
	0	9 000		0	00	0	0	0	0	0		0	0							
	0 09			0	00	0	0	0	0	0		0	0							
	0 0			00	00	00	00	00	00	00		00	00							
	0	00		00	00	00	00	00	00	00		00	00							
	0	0		0	00	0	0	0	0	0		0	0							
	0 0	0		0	00	0	0	0	0	0		0	0							
	0	0 0		0	00	0	0	0	0	0		0	0							
	0	0		0	00	0	0	0	0	0		0	0							
	0	0		0	00	0	0	0	0	90		0	0							
	00	000		0	00	0	0	0	0	0		0	0							
	000	000		0	00	0	0	0	0	0		0	0							
	0	0 0		0	00	0	0	0	0	0		0	0							
	0	00		0	00	0	0	0	0	0		0	0							
	00	000		0	00	0	0	0	0	0		0	0							
	0	00		0	00	0	0	0	0	0		0	0							
	0			0	00	0	0	0	0	0		0	0							
	0 0	000		0	00	0	0	0	0	0		0	0							
	0 0			0	00	0	0	0	0	0		0	0							
	0	000		0	00	0	0	0	0	0		0	0							
				00	00	00	00	00	00	00		00	00							
				00	00	00	00	00	00	00		00	00							
				00	00	00	00	00	00	00		00	00							
	0 0	00		0	00	0	0	0	0	0		0	0							
				0	00	0	0	0	0	0		0	0							
	0			00	00	00	00	00	00	00		00	00							
	0	000		0	00	0	0	0	0	0		0	0							
	0	0 0		0	00	0	0	0	0	0		0	0							
	000			0	00	0	0	0	0	0		0	0							
	000	0		00	00	00	00	00	00	00		00	00							
				0	00	0	0	0	9	00		0	90							
	0 09	0 0		0	00	0	0	0	0	0		0	0							
	0	0		0	00	0	0	9	0	0		0	0							
	0 0	000		0	00	0	0	0	0	0		0	0							
	0 0	0		00	00	00	00	00	00	00		00	00							
	0 000	00		0	00	0	0	0	0	0		0	0							

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Base Neutral/Acid Extractable Compound Concentrations																				
				9 00	9 00	9 00	9 00	9 00	9 0	9 00		9 00	9 00	00	00	00				
	0	0		0	9 0		9			0	9	0		0	0					
				0	9 0				0											
	0	0		0	9 0				0	9										
	00	000		0	9 0				0	9	0	0	0							
	000	9000		0	9 0		9				9									
				0	9 0	0					9		0							
	0	000		0	9 0			0				9								
	0	0				9	9		0		9		0							
	0	0		0	9 0	0										9				
	0	000		0	9 0				0											
	0			0	9 0				0											
	0 0	0		0	9 0				0											
	0	0		0	9 0				0	0	0	0	0							
	0	0		0	9 0															
	00	000		0	9 0				0	0										
	00	000		0	9 0		9		0		0									
	0 0	000		0	9 0				0											
	0	000		0	9 0				0											
				0	9 0				0	90	0									
	0 09	0 0		0 0					0					0	0	9				
	0	0			9 0		9		9		9			9						

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
PCB Concentrations																				
				0 999	0 999	0 999	999	0 999	0 999	0 999		0 999	999	00	00	00				
0	000			0	0		9													
	900			0	0		9													
	900			0	0		9													
	900			0	0		9													
	900			0	0		9													
	900			0	0		0													
0	900			0	0		9													
	900			0	0		0													

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Metal Concentrations																				
				999	999	999	999	999	999	999		999	999	00	00	00				
	0		0	0				0	0 9	0 9	0	0 99	0							
		9			9										0 9	9				
	0 000	00				0		0		0						0				
	00		0	0	0 0	0	0	0	0	0 0	0 0	0	0	0	0	0				
	000		0	0	0	0							0	0	0	0				
	00				9			9	0		0	0		9						
	0 000					9		9				0								
	000			0			9	9				0		90						
	00										0		9 9			9				
	0		0	0 0	0	0							0	0 9	0	0				
	000	0 0						0	0				9 9							
	0 000			0		0							0							
	000	000	0	9		9			90											
	0 000	000		9	0 0		0	9 9				9		9	0					

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Volatile Organic Comound Concentrations in Bank Soil																				
																	00	00	00	00
	0 0	000																		
	0 0	0																		
	9 000	00																		
	0	00																		
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	9 000																			
	0	0																		
	0	000																		
	0	000																		
	0 0	0																		
	0	0 0																		
	000	0																		
	0 09	9 0																		

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Base Neutral/Acid Extractable Compound Concentrations in Bank Soil																				
																	00	00	00	00
	0	0															9	9	9 9	0
																	9	9	9 9	0
	0	0																9		
	00	000																9		
	000	9 000																	0	
																	9			9
	0	000															9	9	9 9	0
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	0	0															9 9	9		
	0	000															0	9	9 9	0
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	0 0	000															9	9	9 9	0
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																	9	9	9 9	0
	0 09	0 0																9	0	0
	0	0															9			9

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
PCB Concentrations in Bank Soil																				
																	00	00	00	00
0	000																			
	900																			
	900																			
	900																			
	900																			
	900																			
	900																			
0	900																			
	900																			

Sample ID	Soil Ingestion RBSL	Migration to Groundwater RBSL	Background Levels	LLC-1	LLC-2	LLC-3	LLC-4	LLC-5	LLC-5D	LLC-5C	LLC-5 average	LLC-6	LLC-7	LLC-8	LLC-8D	LLC-9	BNK-1	BNK-2	BNK-3	BNK-3D
Metal Concentrations in Bank Soil																				
																	00	00	00	00
	0																0		0	
		9																9		0 9
	0 000	00															0		0	
	00																0	0	0	0 9
	000																0	0	0	0 9
	00																	9		
	0 000																			
	000																		9	00
	00																9			
	0																0 9		0	
	000	0																		
	0 000																9		9	9
	000	000															9		9	0
	0 000	000																		0

											0								0
		0.0013		**41.2 J**	**9.7 J**	**16.8**		**10.7**	**7.7 J**	**16 J**	**9.4 J**	**60.1 J**	**44.1**	**94.7**	**18.1**	**41.5 J**	**56.6**	**66.1 J**	**5 J**
	00	**78**															**1350**		
	00	**10**										**9900**							
	0	**3.5**				**730**						**8200**							

												9	0			0			
		0.0013		**15.3 J**	**87 J**	**79.6 J**	**11.5 J**	**28.8**	**30.8 J**	9	**36.6**	**13**	**54.9**	**92.4**	**90.6**	**138**	**65.5**	**45**	**25.4**
	00	**78**																	
	00	**10**																	
	0	**3.5**																	

0

Environmental Indicator Assessment, Current Human Exposure Under Control. 00

											0								0
		0.0013		**44.4 J**	**8.6 J**	**16**			**15.3 J**	**9.3 J**	**14.7 J**		**63.2**	**68.3**		**13.2**	**27.9**	**24.5 J**	**23.8**

												9	0			0			
		0.0013		**43.6 J**	**75**	**82.3**	**3.7 J**	**13.1**		**32.9**	9	**9.5**	**17.3**	**93.2**	**44.3**	**61.9**			

9

0

Environmental Indicator Assessment, Current Human Exposure Under Control. 00

Media	Pollution Report Date (many activities were ongoing for several weeks/months)	Areas Addressed During Cleanup
Soil	009	0 0
	0 0	0 0 0
	0 0	0 0
	0 0	0 0 0
	9 0 0	0
	0 0	0 0
	0 0 0	0 0 0
	0 0	0 0 0 0 0
	0 0	0 0 0 09 0
	0 0 0	0
	0 0	
	0 0	0 0 0 09
	0 0	0 0 0
	0 0	
	0 0	0
	9 0 0	0 0
	9 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0
	9 0 0	
	9 0 0	0
	0 0 0	0 0
	0 0 0	0 0 0 09 0 0 0 0 0
	0 0	0
	0 0	

Media	Pollution Report Date (many activities were ongoing for several weeks/months)	Areas Addressed During Cleanup
Soil (Continued)	0 0	09 0 0 0 0 0 0 0 000 0
	0 0	00 09 0
	0 0	0 0 9 0 0 0 0 0 0
	9 0	0 09 0
	0	0 0 0 0 09 0
	9 0	0 0 0 0 0
	0	0 0
	0	0 0 0 0 0 0
Product	0 009	
	009	
	009	
	009	00 0 0 0 0 0
	009	0 0 0 0 0 0 0 0
	009	0 0
	0 0	0
	9 0 0	00 0

Media	Pollution Report Date (many activities were ongoing for several weeks/months)	Areas Addressed During Cleanup
Product (Continued)	0 0	0 0
	0 0	0 0 0 0 0 0
	0 0 0	0 0 0
	0 0	0 0 09 0
	0 0	0 0 0 0 0 0 0 0
	0 0	000 0
	0 0	0 0 0
	9 0 0	0
	9 0 0	
	0 0 0	00 000 0
	0 0	9 0
	0 0 0	0
	0 0	0 0 0
	0	000 0 0
	9 0	0 000 0
	0	0 000 0 0 0 0 00 0
	0 0	0
	0	0
	0 0	0 0
	0	0 0
	0	0
	0	0
	0	

Media	Pollution Report Date (many activities were ongoing for several weeks/months)	Areas Addressed During Cleanup
Water	0 009	
	009	000
	009	0 0
	0 0	000 0
	0 0 0	00 000 0
	9 0	0 000 0
	0	0
	0 0	0 0 0 0 0
	0	0
	0 0	0

009 0

0

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
0 0 0		0	009		
0 0 0		0	0 0		
09 0			00		
009 0		0 000			
009 0 0		0 0 9 0			
0 0 0 0 0		9			
0 0 0 0 0		9 0			
0 0 0 0 0		0			
0 0 0 0			00 0		
0 0 0		0 000			
0 0		90 000			

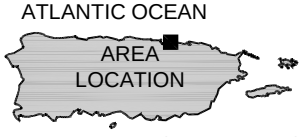
Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
0 0 0		000			
0 0 0		0 0 000			
0 0 0		000			
0 0		0 000			
0		000			Petro West
0 0 0 0 0		00 000			
0 0		0 000			
0 9 0		000			
0		0 000			
0 0		000			
0 0 0 0 0 0					
0 0 0 0 0 0		9			

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
0 0 0 0 0			0		
0 0 0 0 0		0 000			
0 0 0 0		90			
0 0 0 0 0		00			
0 0 0 0 0			9		
0		000			
0 0 0 0 0 0			9		
0		0 000			
9 0 0		0 000			
0 0		0 000			
0 0		9			
0 0		9			
0 0		9 0			

9 0

0

REFERENCE: GEOLOGICAL SURVEY CONTROL BY USGS AND NOS/NOAA, BAYAMON AND SAN JUAN QUADRANGLES, PHOTO REVISED 1982.



PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

FACILITY LOCATION MAP

ARCADIS PUERTO RICO

FIGURE 1

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB0045709\0000\00501\DWG\45709N01.dwg LAYOUT: 1 SAVED: 11/2/2011 9:59 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: A4X PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/2/2011 10:00 AM BY: KRAHMER, ERIC
XREFS: 45709XBL IMAGES: tank farm.TIF PROJECTNAME: ---

PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

FACILITY LAYOUT AND CURRENT WASTE AREAS

ARCADIS PUERTO RICO

FIGURE
2

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\0045709\00\005011\DWG\45709G01.dwg LAYOUT: 2 SAVED: 11/2/2011 11:15 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/2/2011 11:17 AM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ----
45709X8L
45709X01

SWMU No. SWMU DESCRIPTION

1	CONTAINER STORAGE AREA
2	SLOP OIL TANK 1000
3	SLOP OIL TANK 1001
4	SOLIDS KNOCKOUT PIT
5	SURGE TANK ET–1
6	API SEPARATOR
7	CORRUGATED PLATE INTERCEPTOR
8	EQUALIZATION BASIN
9	INLET BASIN TO BIOLOGICAL REACTOR #1
10	DIGESTER
11	OLD OIL LAGOONS
12	OLD EAST SEPARATOR
13	SLOP OIL TANK 452
19	NATURAL AERATION BASIN
32	OLD LANDFILL
33	NON–HAZARDOUS DISPOSAL SITE
34	SULFUR LAGOON
35	CATALYTIC WASTE POND
37	SULFUR DRUM STORAGE AREA
38	CENTRIFUGE
39	GRAVITY THICKENER
40	SCRAP METAL YARD

AOC No. AOC DESCRIPTION

1	CRUDE UNIT CHARGE PUMP AREA
2	FUEL OIL TRANSFER PUMP (CUMMINS) AREA
3	FUEL OIL TRANSFER PUMP AREA NEAR TANK 603
4	ASPHALT HEATER UNIT
5	FUEL OIL LOADING RACK PUMP AREA
6	DEBUTANIZER REBOILER AREA
7	FCC UNIT COMPRESSOR LUBE SYSTEM AREA
8	HEAT EXCHANGER BUNDLES AT HEAVY CYCLE STEAM GENERATOR
9	CRUDE UNIT No. 1 AREA
10	CRUDE UNIT No. 1 NEAR HEAT EXCHANGER BUNDLE AREA
11	FUEL OIL PIPELINE SPILL AREAS
12	OLD LOADING RACK

0m 100m 200m

GRAPHIC SCALE 1:4000

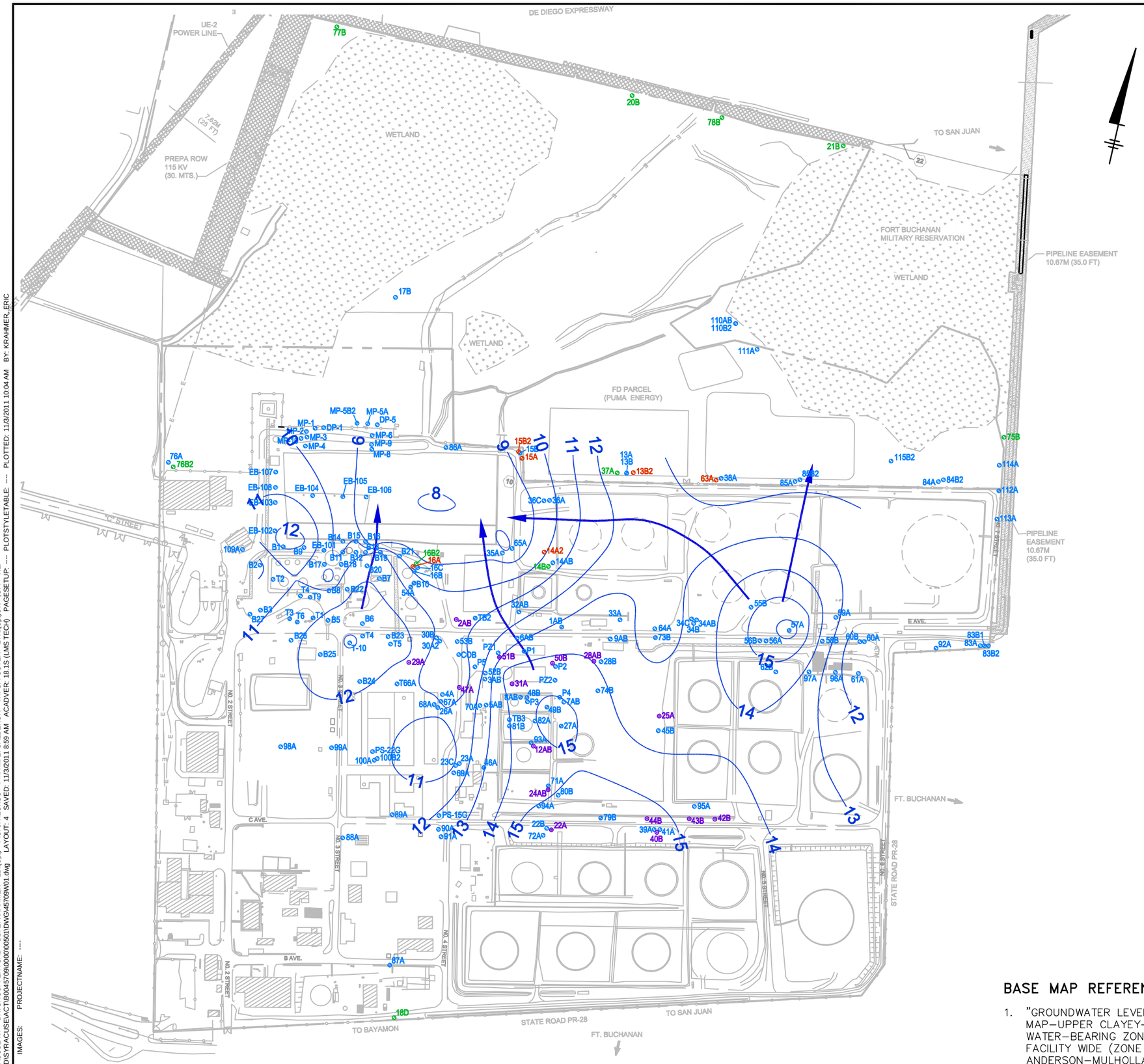
PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

SOLID WASTE MANAGEMENT UNITS & AREAS OF CONCERN UNDER 1995 ORDER

ARCADIS PUERTO RICO

FIGURE 3

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB0045709\000\005011DWG\45709G02.dwg LAYOUT: 3 SAVED: 11/2/2011 11:44 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/2/2011 11:47 AM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ----
45709X02 1166_001_4.tif
45709XBL 1166_001_5.tif



LEGEND:

- MONITORING WELL
- MONITORING WELL (SAMPLED SEMIANNUALLY)
- MONITORING WELL (SAMPLED ANNUALLY)
- RECOVERY WELL
- 15 — GROUNDWATER ELEVATION CONTOUR
- DIRECTION OF GROUNDWATER FLOW

NOTES:

1. CONSTRUCTED FROM SEPTEMBER 26, 2009 DATA.
2. MONITORING WELLS 22A, 39A, 54A, 56A, 63A, 82A, T2 AND B4 NOT INCLUDED IN GROUNDWATER CONTOUR CALCULATIONS.

0m 100m 200m

GRAPHIC SCALE 1: 4000

BASE MAP REFERENCE:

1. "GROUNDWATER LEVEL MAP–UPPER CLAYEY–SEDIMENT WATER–BEARING ZONE–FACILITY WIDE (ZONE A)" BY ANDERSON–MULHOLLAND & ASSOCIATES, INC., WHITE PLAINS, NEW YORK. DATED NOVEMBER 2009.

PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

GROUNDWATER CONTOUR MAP - ZONE A - SEPTEMBER 2009

ARCADIS PUERTO RICO

FIGURE 4

CITY: SYRACUSE NY DIVGROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*OFF=*REF*
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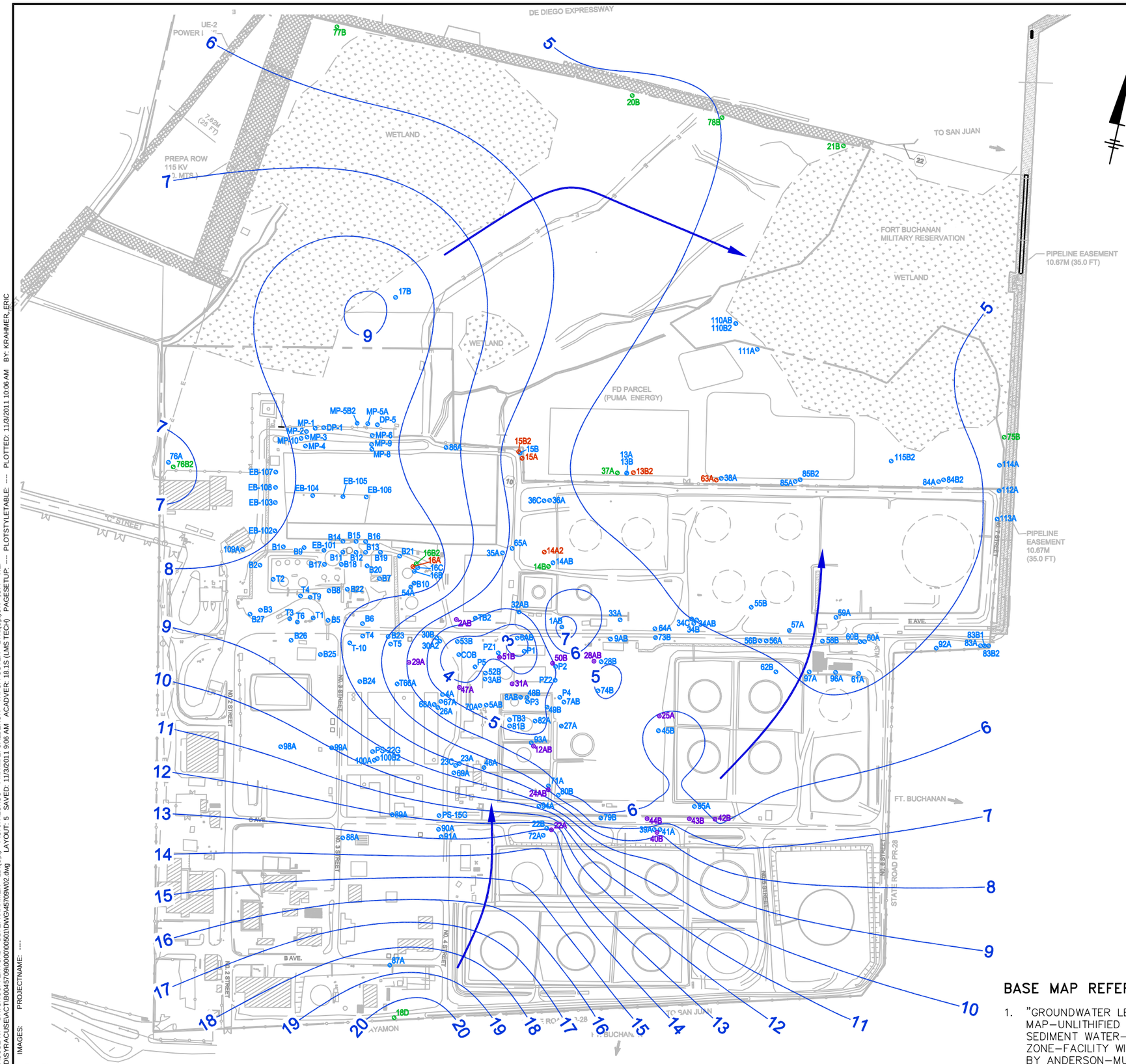
45709X02
45709X8L
45709X03
IMAGES: PROJECTNAME: ----



LEGEND:

- MONITORING WELL
- MONITORING WELL (SAMPLED SEMIANNUALLY)
- MONITORING WELL (SAMPLED ANNUALLY)
- RECOVERY WELL
- 5 GROUNDWATER ELEVATION CONTOUR
- DIRECTION OF GROUNDWATER FLOW

NOTES:

1. CONSTRUCTED FROM JUNE 26 – JULY 3, 2009 DATA.
2. MONITORING WELLS 5AB, 34B, 52B, 56B, 73B NOT INCLUDED IN GROUNDWATER CONTOUR CALCULATIONS.

0m 100m 200m

GRAPHIC SCALE 1: 4000

BASE MAP REFERENCE:

1. "GROUNDWATER LEVEL MAP–UNLITHIFIED CARBONATE SEDIMENT WATER–BEARING ZONE–FACILITY WIDE (ZONE B)" BY ANDERSON–MULHOLLAND & ASSOCIATES, INC., WHITE PLAINS, NEW YORK. DATED NOVEMBER 2009.

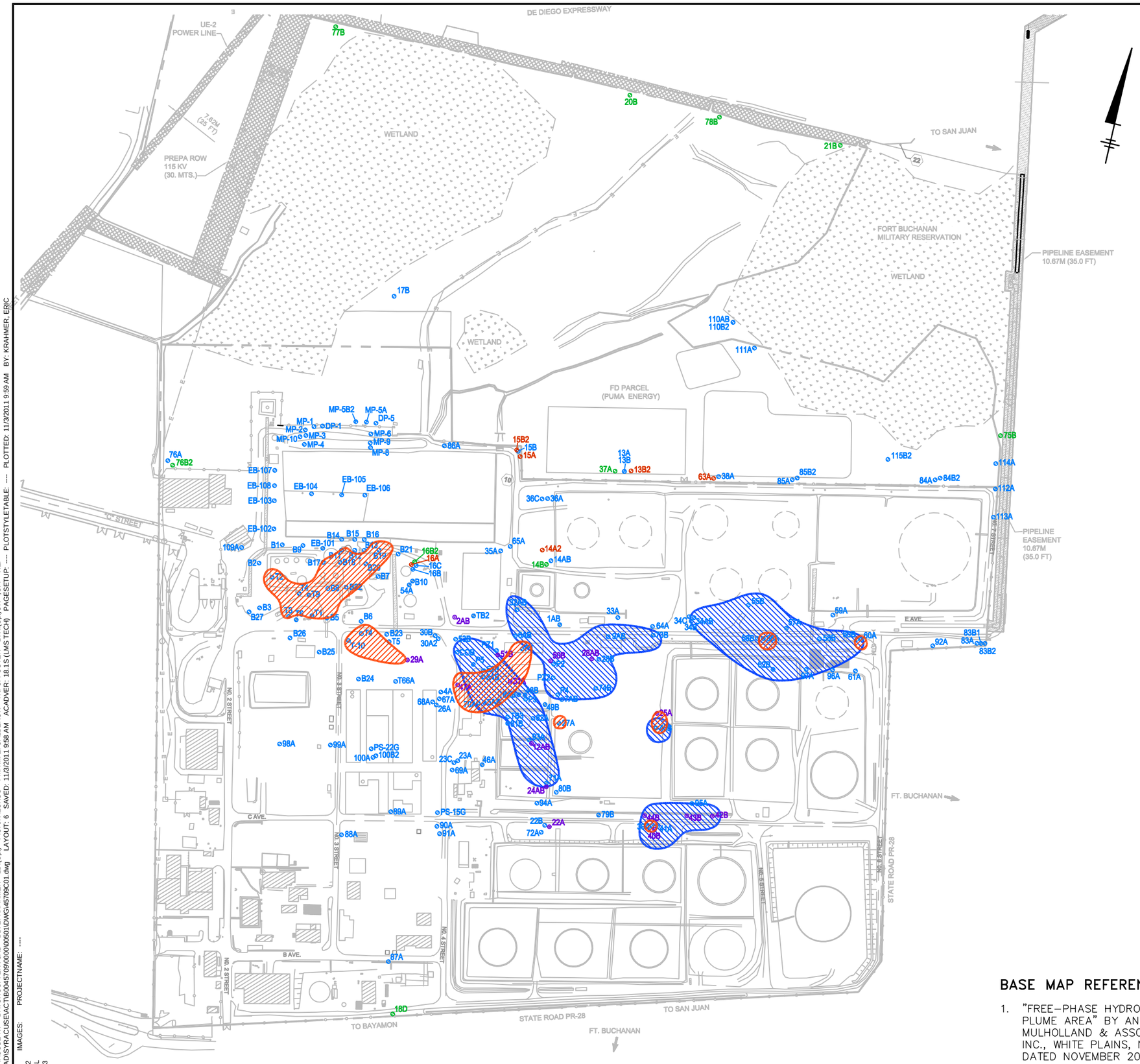
PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

GROUNDWATER CONTOUR MAP - ZONE B - JUNE-JULY 2009

ARCADIS PUERTO RICO

FIGURE 5

CITY: SYRACUSE NY DIVGROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\00457090\00\005011DWG\45709W02.dwg LAYOUT: 5 SAVED: 11/3/2011 9:06 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ---- PLOTTED: 11/3/2011 10:06 AM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ----
45709X02
45709XBL
45709X03



LEGEND:

- MONITORING WELL
- MONITORING WELL (SAMPLED SEMIANNUALLY)
- MONITORING WELL (SAMPLED ANNUALLY)
- RECOVERY WELL
- HYDROCARBON PLUME – ZONE A
- HYDROCARBON PLUME – ZONE B

NOTES:

1. EXTENT OF FREE–PHASE HYDROCARBON BASED ON SEPTEMBER 2008 DATA.

0m 100m 200m

GRAPHIC SCALE 1: 4000

BASE MAP REFERENCE:

1. "FREE–PHASE HYDROCARBON PLUME AREA" BY ANDERSON–MULHOLLAND & ASSOCIATES, INC., WHITE PLAINS, NEW YORK. DATED NOVEMBER 2009.

PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

FREE-PHASE HYDROCARBON PLUME AREA

ARCADIS PUERTO RICO

FIGURE 6

CITY: SYRACUSE NY DIVGROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\00457090\005011DWG\457709C01.dwg LAYOUT: 6 SAVED: 11/9/2011 9:58 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ----
XREFS: 457709X02 457709XBL 457709X03
IMAGES: PROJECTNAME: ----

LEGEND:

PHASE I RECONSTRUCTION AND DEMOLITION WHICH INCLUDES ENVIRONMENTAL ASSESSMENT AND DEMOLITION OF EXISTING REFINERY, CONTROL BUILDINGS AND WAREHOUSE BUILDINGS ON SITE.

PHASE II CONSTRUCTION OF TANK FARM TO INCREASE STORAGE CAPACITY TO 1.39 MILLION BARRELS.

PHASE III POTENTIAL EXPANSION TO 5 MILLION BARRELS CAPACITY.

NOTE:
DASHED TANKS WILL BE REFURBISHED OR DEMOLISHED AND REPLACED DEPENDING ON CONDITION.

0m 100m 200m

GRAPHIC SCALE 1: 4000

PUMA ENERGY CARIBE, LLC
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON, PUERTO RICO

PROPOSED CONSTRUCTION PHASES

ARCADIS PUERTO RICO

FIGURE 7

CITY: SYRACUSE,NY DIV/GROUP: ENVCAD DB: E. KRAHMER LD:(Opt) PIC: J. ALONSO PM/TM: E. CALDERON TR: C. FOSTER LYR:(Opt)ON=*;OFF=*REF*
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45709XBL
45709X01
IMAGES:
SNY04P691111031042D.tif
PROJECTNAME: ----

Appendix A

1995 RCRA Order

AGREEMENT WITH NEW PURCHASER - PUMA ENERGY CARIBE, LLC.
Docket No.: RCRA-02-2011-7305

(MODIFICATION OF 1995 ADMINISTRATIVE ORDER ON CONSENT
Docket No.: II RCRA-95-3008(h)-0303)

Caribbean Petroleum Corporation ("CPC") and Region 2 of the United States Environmental Protection Agency ("EPA") entered, in 1995, into the above-referenced Administrative Order on Consent ("1995 AOC") pursuant to Section 3008(h) of RCRA, 42 U.S.C. 6928(h), for the property located at Carr # 28, Km. 2, Luchetti Industrial Park, Bayamon, in the Commonwealth of Puerto Rico, 00961 (the "Facility").

On August 12, 2010, CPC, Caribbean Petroleum Refining, LP and Gulf Petroleum Refining (Puerto Rico) Corporation (the "Debtors") filed voluntary petitions for relief pursuant to Chapter 11 of the United States Bankruptcy Code in the Bankruptcy Court for the District of Delaware. The cases are docketed as 10-12553, 10-12554, and 10-12555, respectively, and are jointly administered under Case No. 10-12553. On December 16 and 17, 2010, the Debtors held an auction to sell their assets. Puma Energy International, BV was the successful bidder in the auction for substantially all of the debtors' assets with a bid of $82 million. On December 22, 2010, the Bankruptcy Court authorized the sale of all assets in the Bankruptcy estate subject to certain conditions to Puma Energy International, BV, which assigned its rights to Puma Energy Caribe, LLC. ("Puma").

Puma intends to purchase the Facility. In accordance with the December 22, 2010 sale order issued by the United States Bankruptcy Court in the District of Delaware (Case Nos. 10-12553, 10-22554 and 10-12555), Puma's obligation to purchase the Facility is conditioned upon entering into satisfactory environmental settlements with EPA, including this "Agreement with New Purchaser – Puma Energy Caribe, LLC." ("Agreement").

EPA and Puma recognize that the negotiation resulting in this Agreement, which modifies the 1995 AOC, has been performed in good faith. Puma agrees to comply with and be bound by the terms of the 1995 AOC as modified by this Agreement and further agrees that it will not contest the basis, validity or terms of the 1995 AOC as modified by this Agreement. The provisions in this Agreement reflect the unusual circumstances of the parties' negotiations, within the context of the bankruptcy proceeding of the Debtors, and the provisions of the 1995 AOC as modified by this Agreement are not to be considered precedential by Puma or any third party or with respect to any matter unrelated to the 1995 AOC as modified by this Agreement or the Facility.

Through Puma's pre-closing due diligence with respect to the Facility, including review of information provided by the United States, Puma learned that the Facility's prior owner and operator caused or created conditions which have resulted in unsatisfactory environmental conditions at the Facility. Puma has never owned or operated the Facility, and it voluntarily enters into this Agreement. The parties believe that the Work to be performed under this Agreement to address certain environmental conditions at the Facility is protective of human health and the environment and will benefit the community in the vicinity of the Facility, as well as the greater community in Bayamon, Puerto Rico.

EPA and Puma, as the prospective purchaser of the Facility, hereby enter into this Agreement as a modification to the 1995 AOC. Following signature by Puma and EPA, this Agreement shall become effective upon Puma's closing of its acquisition of the Facility (the "Effective Date").

Puma and EPA hereby agree that upon the Effective Date, Puma shall replace CPC as the party responsible for implementing remaining obligations under the 1995 AOC, as modified by this Agreement. The parties agree that Puma is not responsible for any liabilities, penalties or subject to other enforcement actions related to (i) noncompliance with the 1995 AOC prior to the Effective Date of the Agreement, or (ii) fees, costs or expenses incurred by or on behalf of the EPA in connection with the 1995 AOC or other RCRA Subtitle C activities at the facility prior to the Effective Date.

Puma agrees that commencing upon the Effective Date, it is subject to the terms and conditions set forth in the 1995 AOC as modified herein, including but not limited to the implementation of remaining investigations, assessments, corrective measure studies, and interim measures required under the 1995 AOC as modified herein, as well as the implementation of corrective measures and any additional work which may be required pursuant to Section VII of the 1995 AOC. Puma and EPA also agree that the Additional Work provision set forth in Section VII shall be modified to include, without limitation, any new work EPA requires under RCRA to protect human health and the environment at previously identified or newly identified solid waste management areas or areas of concern, or any work EPA requires under RCRA to address contamination that has occurred or that has been discovered at the Facility since the issuance of the 1995 AOC. Such new work may be required by EPA due to prior Facility operations, current or future releases at the Facility, the explosions that occurred at the Facility in October 2009, natural events such as hurricanes and/or as necessary to protect human health and the environment. Puma acknowledges that some of the work completed in the past by CPC (or other third parties, including EPA) may have to be performed again if that prior work is deemed by EPA under RCRA to be inadequate, presently insufficient or no longer protective of human health or the environment. EPA acknowledges that some of the work completed in the past by CPC (or other third parties, including EPA) will not have to be performed again if EPA determines under RCRA that the prior work was adequate, presently sufficient and protective of human health and the environment.

The parties also agree that the 1995 AOC is hereby modified so that Puma assumes responsibility to implement corrective measures, according to specifications approved by EPA following consultation with Puma and any public process deemed appropriate by EPA. Puma further agrees to comply with all applicable post-closure requirements set forth in Subpart G of 40 C.F.R. Part 265 for the closed equalization basin at the Facility.

To help define the work which Puma will be required to perform at the Facility under the 1995 AOC as modified by this Agreement, the parties agree that within one hundred and eighty (180) days of the Effective Date, or by such other deadline as agreed to by the EPA and Puma, Puma shall submit a draft report to EPA for its review and approval setting forth a description and evaluation of the Current Conditions of the Facility ("Current Conditions Report" or "CCR"). To the extent reasonably possible due to limited information available to Puma about the Facility and CPC's and CPC's predecessors' operations at the Facility and as appropriate for

a CCR prepared in 2011, the draft Report should be completed in accordance with the applicable criteria set forth in Task I of Attachment II of the 1995 AOC. The draft Report should further include a summary of work that has been performed to date (to the extent known or available following reasonable inquiry), including an evaluation as to whether this work needs to be performed again and/or updated for any reason (*i.e.*, the October 2009 explosions and/or hurricane events), as well as an evaluation of the need for new additional work to delineate the current nature and extent of contamination at the Facility and/or from the Facility to the extent required by the provisions herein regarding off-site conditions (*i.e.*, investigatory work, new installation or repair of wells, elimination of data gaps, *etc.*).

Based on the conditions documented and work performed at the Facility to date, the draft Report shall include a "Work Recommendation" section identifying the future work Puma believes is appropriate and the bases for its recommendations. Recommended tasks may include: (a) additional investigatory work (*i.e.*, "RCRA Facility Investigation" or "RFI") for all or a portion of the Facility, including any off-site contamination to the extent required by this Agreement; (b) the development of a Corrective Measures Study ("CMS") for all or a portion of the Facility or for different media at the Facility; (c) the removal of contamination in specific areas; and/or (d) other interim or stabilization measures, if any. The Work Recommendation should include a preliminary proposed schedule for the implementation of these recommended tasks. This preliminary schedule may include a phased implementation of the various tasks, taking into account risk to human health and the environment, if any, and Puma's planned redevelopment of the Facility.

In its CCR, Puma may propose and EPA will review and determine the extent to which Puma will not be required to perform certain steps identified in the 1995 AOC as modified herein, such as the submission of a RFI Workplan or evaluation of different remedial options in a formal Corrective Measure Study, for all or parts of the Facility, including any off-site contamination to the extent required by this Agreement, or for contamination of different media at or connected to the site. Puma may propose and EPA will also review and determine whether Puma may perform more abbreviated versions of the work requirements set forth in the 1995 AOC as modified herein.

To the extent these considerations are applicable and/or appropriate, consistent with then applicable EPA guidance and/or regulations, and protective of human health and the environment, the parties agree, during the implementation of the 1995 AOC as modified herein, to consider the following: i) the continued use of the Facility as an industrial bulk oil terminal, ii) the goal of expediting the investigation and corrective actions at the Facility and minimizing costs to the extent there are alternative options which are protective of human health and the environment, iii) cleanup standards for industrial properties (subject to any change in property usage), risk-based assessments, engineering controls and/or institutional controls, as appropriate, iv) Puma's preference to employ a holistic approach to the investigation and remediation of the Facility rather than a solid waste management unit ("SWMU") by SWMU and an area of concern by area of concern analysis as long as the investigation(s) and corrective action(s) are protective of human health and the environment and/or v) application of EPA's then current (versus those in place in 1995) corrective action approaches and/or standards, notwithstanding provisions contained in Attachments II and III of the 1995 AOC. The parties agree to use a collaborative approach in the preparation and early review of the CCR and the Work

Recommendations such that EPA and Puma can meet as appropriate during the process, discuss plans and proposed actions with the goal of causing the documents submitted to the EPA for review to be close to an agreed upon course of action, subject to final EPA determinations and any input received in any public comment processes.

EPA will review the draft CCR, including the Work Recommendation section, and will then issue comments, if any, or approval of the CCR including the Work Recommendation section and/or meet with Puma if discussions are warranted. Thereafter, within forty five (45) days, or as otherwise agreed, Puma shall submit a final CCR, including a Work Recommendation section, with revisions responsive to EPA's comments.

Regarding corrective measures, proposed remedies recommended by Puma may be based on appropriate cleanup standards for industrial properties (subject to any change in property usage), risk-based assessments and/or engineering and/or institutional controls as appropriate. Puma may recommend to EPA which of these clean-up standards it would like to use. All proposed final remedies will be subject to public comment and must be approved by EPA.

Regarding off-site conditions, if Puma will be conducting an EPA approved investigation within the borders of the Facility, Puma agrees to extend the investigation beyond the Facility's boundaries if EPA, based on known information, determines that contamination from the Facility may extend beyond the boundaries of the Facility, provided Puma is able to obtain any required access. If Puma is unable to obtain off-site access pursuant to the provisions set forth in the 1995 AOC as modified herein, EPA reserves its right to seek such access on behalf of EPA and/or Puma. Puma may propose on-site remediation alternatives to EPA which may be implemented by Puma in lieu of extending its investigation beyond the Facility's boundaries.

For the purposes of the 1995 AOC as modified herein, Puma shall only be required to address (which may include remediation) off-site contamination, if: 1) EPA determines such contamination emanated from, or was released from the Facility; and 2) the off-site contamination is contiguous and/or adjacent to the Facility (*e.g.*, contaminated groundwater flowing from beneath the Facility, contaminated creek sediments in Creeks which extend off-site from the Facility's boundaries, etc.).

Puma shall <u>not</u> be responsible, under the 1995 AOC as modified herein, for the investigation and/or remediation of any historical contamination potentially released from the Facility via air emissions which have been deposited in areas which are not contiguous or adjacent to the Facility (*e.g.,* contamination deposits in non contiguous/non adjacent locations relating to the explosion or air emissions from petroleum refining operations, etc.).

Regarding the Wetlands, starting within the boundaries of the Facility, Puma will perform a wetlands assessment, pursuant to an EPA approved workplan or as otherwise approved, to characterize Facility related contamination in the wetlands to determine any potential impact(s) to the wetlands from i) contamination from the Facility and/or ii) the oil recovery structures placed in the wetlands (e.g., booms, berms, baffles, underflow dam, gabion structure). Puma

may begin its assessment by delineating the wetlands, performing a modified hydrogeomorphic ("HGM") functional analysis and conducting water, soil and sediment sampling in the creek and wetlands, as well as upland soil sampling. Based on these results, including recommendations by Puma, EPA will determine if the on-site wetlands assessment is complete and/or requires additional work including an evaluation of any Facility related impact to the groundwater from contamination in the wetlands. Based on the results of the on-site assessment, including any recommendations made by Puma, EPA will determine if an off-site wetlands assessment is necessary provided such work is consistent with Puma's responsibilities under the 1995 AOC as modified herein for off-site conditions.

Based on the data and information collected during the wetlands assessment, including recommendations made by Puma, EPA shall determine whether an ecological risk assessment is required. Based on the information collected during the evaluation of the wetlands, including the ecological risk assessment, if one was required, and other factors EPA considers relevant, including recommendations made by Puma, EPA shall determine the extent to which corrective measures, if any, are required in the wetlands, including wetlands located off-site to the extent such work is consistent with Puma's responsibilities under the 1995 AOC as modified herein for off-site conditions. Potential corrective measures may include, among others, a no action alternative or the use of natural attenuation.

Regarding scheduling, Puma shall propose detailed implementation schedules in any workplan that EPA requires Puma to submit under the 1995 AOC, as modified herein. Proposed schedules may include a phased implementation of the various tasks, taking into account risk to human health and the environment, if any, the necessity to obtain any required permits and Puma's planned redevelopment of the Facility. EPA understands that wells may have been destroyed by the fire or otherwise rendered inoperable and EPA agrees to provide sufficient time to allow Puma to perform the all tasks required by this Agreement, including required sampling, monitoring and corrective action. With the exception of the timeframes set forth in Sections VI.6.b, VI.7, IX, X.2, XI, XII.3, XIII, XIV, XV, and XVIII of the 1995 AOC, all deadlines and timeframes in the 1995 AOC are tolled until Puma submits the CCR and the Work Recommendation and new schedules are established which shall supersede the deadlines and timeframes in the 1995 AOC. Section XXIII (Modification) of the 1995 AOC is modified so that the Project Coordinator may agree to changes in the scheduling of events.

To the extent Puma has previously submitted plans (*i.e.*, investigatory workplans) or other documentation (*i.e.*, financial assurance) to EPA in connection with work at the Facility, Puma may cross-reference these submissions if appropriate to meet the requirements of the 1995 AOC, as modified herein. If EPA determines and notifies Puma in writing that these submissions are not adequate for the purposes of the 1995 AOC as modified herein, Puma must either revise the submissions or submit a new document that is acceptable to EPA. EPA may ask Puma to submit a copy of the referenced submission to the Project Coordinator. Puma may elect to use one Health and Safety Plan and one Quality Assurance Plan for all of the administrative agreements entered into with EPA for the Facility, modified and supplemented as necessary to address all aspects of the Work required under the 1995 AOC as modified herein.

Puma shall submit quarterly status reports to EPA. The 1995 AOC is hereby modified to include a new provision, Subsection VI.8 (Quarterly Status Reports):

VI.8 QUARTERLY STATUS REPORTS

(a) Puma shall submit Quarterly Status Reports to EPA's Project Coordinator pursuant to the provisions set forth in Section IX.2 of the1995 AOC, as modified herein. The first Quarterly Status Report shall be submitted within ninety (90) days of the Effective Date. Quarterly Status Reports shall, at a minimum, include unless otherwise agreed: i) a summary of all work performed in the prior period; ii) a summary of any difficulties encountered in carrying out the terms of the 1995 AOC, as modified herein during the prior period; iii) an explanation of the work which has not been timely completed, the basis of the delay, and planned corrective action(s); iv) a summary of all analytical results that have become available during the previous quarter; and v) any and all data results since the prior Quarterly Status Report. Puma and the Project Coordinator, however, may confer and agree that supporting data need not be submitted in a particular Quarterly Status Report. Upon EPA's reasonable request, Puma shall supplement a Quarterly Status Report with more information, documentation and/or data relating to technical aspects of work being performing under this 1995 AOC as modified.

(b) To the extent any other provision of the 1995 AOC as modified herein requires the submission of status reports, unless otherwise agreed, the information required in those status reports should be included in the Quarterly Status Reports referenced herein, in lieu of submitting a separate status report under another provision of the 1995 AOC, as modified herein.

(c) Quarterly Status Reports must be submitted by a representative of Puma, which can be an authorized contractor, knowledgeable about the submission.

Puma shall obtain financial assurance for corrective action. The 1995 AOC is hereby modified to include a new provision, Subsection VI.9 (Financial Assurance for Corrective Action):

VI.9 FINANCIAL ASSURANCE FOR CORRECTIVE ACTION

(a) Puma shall obtain financial assurance for all corrective action performed at the Facility as required by the 1995 AOC as modified herein. Puma may obtain financial assurance either: i) in the amount of five million dollars within ninety (90) days of its acquisition of the Facility; or ii) it may develop cost estimates for each workplan submitted under the 1995 AOC, as modified herein and obtain financial assurance for the work identified in each workplan pursuant to the following criteria.

(b) To the extent Puma is obtaining financial assurance on a per workplan basis pursuant to Paragraph VI.9(a)(ii), Puma shall:

i) Within thirty (30) days of the submission of any workplan submitted under the Order, Puma shall submit to EPA for its review and approval a cost estimate for the actions specified in the submitted workplan; and

ii) Within ninety (90) days of the approval of Puma's cost estimate, Puma shall establish financial assurance for each correction action activity identified in a workplan in an amount not less than the amount approved by EPA and submit a demonstration of such financial assurance to EPA.

(c) To the extent Puma is obtaining financial assurance for five million dollars pursuant to Paragraph VI.9(a)(i), Puma shall submit a demonstration of such financial assurance to EPA within ninety (90) days of the Effective Date. (The adequacy of the amount of financial assurance is subject to annual review pursuant to Paragraph 9(h) below.)

(d) In complying with these provisions, Puma may use one or more of the financial assurance mechanisms set forth in 40 C.F.R. Part 264 Subpart H, and should refer to these provisions to ensure the acceptable use of such mechanisms. (The wording of these mechanisms, however, must be modified from that set forth in the referenced regulations since these regulatory provisions do not specifically cover corrective action. The modified language must be appropriate for financial assurance for corrective action.)

(e) Cost estimates and corresponding financial assurances shall include, to the extent applicable, costs for the following: the installation and repair of groundwater wells; the collection and analysis of samples; investigatory work; soil removal and/or other necessary remediation measures; operation and maintenance; post closure care requirements; and any other costs which are part of the correction action under this 1995 AOC as modified herein.

(f) If Puma's chosen financial assurance option/financial instrument involves the designation of a beneficiary or trustee, Puma shall name EPA the beneficiary or trustee.

(g) EPA reserves the right to require modification of the cost estimates and/or financial assurance instrument(s) submitted (including updated demonstrations submitted pursuant to Paragraph 9(h) below) if the Agency finds that Puma's mechanism(s) do not assure adequate funding or that such funds will not be accessible to EPA, Puma, or the party charged with completing the corrective action activities deemed necessary and appropriate by EPA. Such instruments shall remain in force until EPA approves the completion of the corrective action activity(ies) and releases Puma, in writing, from its financial assurance obligation. To the extent appropriate, EPA will recognize the completion of portions of the corrective action activity(ies) and authorize Puma, in writing, to reduce the corresponding amount of its financial assurance obligations.

(h) Cost estimates and financial assurance demonstrations (including the use of alternative mechanism(s)) submitted pursuant to Paragraphs 9(b) or 9(c) shall be updated and submitted to EPA for its review and approval, on an annual basis,

and also when requested by either EPA or Puma, or as otherwise necessary (*i.e.*, whenever proposed or selected corrective action activities are added, work plans are modified, or other available information indicates that there may be an increase in the anticipated costs.) Cost estimates and financial assurances may be reduced as work is completed and approved by EPA. Reductions in financial assurance obligations must be approved in writing by EPA.

Pursuant to Section IX of the 1995 AOC (Project Coordinator/Information), EPA's Project Coordinator is David Cuevas, who is located in EPA's Caribbean Field Office and can be reached by email at cuevas.david@epa.gov or by telephone at 787 977-5856, and Puma's Project Coordinator is Brenda Torano Diaz, who can be reached by email at Brenda.torano@puma-energy.com or by telephone at 787 622-6499. Additionally, Section IX.2 of the 1995 AOC is hereby modified so that originals and/or copies of information submitted to EPA shall be directed to:

Director
Land Pollution Control Division
Puerto Rico Environmental Quality Board
P.O. Box 11488
Santurce, PR 00910
(One hard copy and one electronic copy)

EPA Project Coordinator
Response and Remediation Division
Caribbean Environmental Protection Division
Region 2
U.S Environmental Protection Agency
1492 Ponce de Leon Avenue
Centro Europa Bldg. Ste 417
San Juan, PR 00907
(Two hard copies and one electronic copy)

No other copies are necessary unless specifically requested by EPA. All submissions must identify this action by name and docket number.

Regarding other EPA personnel referenced in the 1995 AOC, the parties agree that upon the Effective Date, all references to the Director of Air and Waste Management Division of EPA, Region II, shall be substituted with a reference to the Director of Caribbean Environmental Protection Division, Region 2, EPA, and all references to the EPA Branch Chief of the Air and Waste Management Division, Hazardous Waste Facilities Branch, Region II shall be substituted with a reference to Branch Chief, Response and Remediation Branch, Caribbean Environmental Protection Division, Region 2, EPA.

The parties agree to the following adjustments to certain provisions in the 1995 AOC:

(a) Section II.1 is modified so that the reference to Caribbean Petroleum Corporation and Respondent is substituted with "Puma," as defined by this Agreement; Paragraph 2 of Section II is modified to state in its entirety: "This Order and the responsibilities and obligations it imposes, shall apply and bind the Respondent. To the extent Respondent sells, assigns or transfers ownership of the Facility, it agrees to make such sales, transfers or assignments contingent upon the transferee, successor, purchaser and/or assignee agreeing to accept the obligations of the 1995 AOC as modified herein."; Paragraph 3 of Section II is modified to read in its entirety "Regardless of Puma's employ of, contractual agreement and/or relationship with any entity regarding the implementation of this 1995 AOC as modified herein, Puma remains ultimately liable for failure to carry out, or comply with, any term or condition imposed by the 1995 AOC, as modified herein"; Paragraph 5 of Section II is modified so that it begins with the following phrase: " To the extent corrective action and/or post closure care is continuing under the terms of the 1995 AOC, as modified herein, Puma shall give notice,...."

(b) Section III is modified so that it solely contains the first sentence of the first Paragraph (all other sentences in Section III are deleted in their entirety) and the reference to Respondent in the first sentence is substituted with "Puma."

(c) Section IV.1 is modified so that the reference to Caribbean Petroleum Corporation is substituted with "Puma." The remaining provisions of Section IV are modified and/or deleted to the extent no longer accurate.

(d) Section V is modified so that all references to Respondent shall be substituted with Puma, Paragraph 2 of Section V is modified and/or deleted to the extent no longer accurate.

(e) Section X, Paragraph 1 is modified to the extent EPA approves a Quality Assurance and Quality Control ("QAQC") plan for all or a portion of the work being performed at the Facility that supersedes, as determined by the Project Coordinator, any QAQC plan, standard or procedure discussed in Paragraph 1.

(f) Section XII is modified so that all references to Respondent shall be substituted with Puma; Paragraph 1 of Section XII is modified so that it be begins with the phrase "For the purposes of verifying or overseeing work performed at the Facility in connection with the 1995 AOC, as modified herein, Puma shall ....; Paragraph 1.d of Section XII is modified to include the following language at the end of the provision: "to the extent the use of such equipment is not inconsistent with Puma's legitimate health and safety concerns regarding potential explosions and/or fires which may be triggered by the use of such equipment."

(g) Section XVI is modified to add at the end of the end of Paragraph 7, the following language: "To the extent EPA has determined that Puma is complying with, and timely completing work pursuant to, the 1995 AOC as modified herein, EPA will not initiate civil enforcement actions under RCRA (or take other removal and/or remedial actions) for the performance of work being conducted under the terms of the 1995 AOC as modified herein, unless EPA

determines that such actions are necessary for the protection of human health and the environment."

(h) Section XVII is modified to include the additional bolded language "Nothing in this **1995 AOC as modified herein** shall constitute …."

(i) Section XXVI, Paragraph 1, is modified to state: "Unless i) the 1995 AOC as modified herein has been modified pursuant to Section XXIII, ii) Puma is excused under Section XXVII and/or XXVIII of the 1995 AOC as modified herein or iii) a time period or deadline is tolled pursuant to this Agreement, if Puma fails to comply with any requirement, term or condition set forth in the 1995 AOC as modified herein, it shall pay a Stipulated Penalty for each non-complying act as set forth in the chart below. To the extent submittals that end up being required pursuant to the provisions of the 1995 AOC as modified herein are not specifically identified as a Deliverable in the chart in Section XXVI, those submittals shall be classified as an interim measure for the purposes of Section XXVI unless EPA determines a different Deliverable category is more analogous. The parties acknowledge that as provided by the 1995 AOC as modified herein, Puma may not be required to prepare and submit all the Deliverables listed in the chart in Section XXVI."

(j) Section XXVIII is modified so that all references to Respondent are substituted with "Puma," all references to the Director of the Air and Waste Management are substituted with the "Director of Caribbean Environmental Protection Division, Region 2, EPA ("Director")" and all references to the Order are substituted with "the 1995 AOC as modified by herein." Additionally, the third and fourth sentences of Paragraph 1 are deleted and substituted with the following sentence: "Said notice shall set forth the specific points of the dispute, the position Puma is maintaining, the basis (bases) for Puma's position, any matters Puma considers necessary for EPA's determination, and, to the extent desired by Puma, a request for a meeting with the Director (or his designee with Puma's consent) regarding the dispute, who shall review the dispute and following a meeting with Puma if requested shall provide to Respondent his decision on the pending dispute, which shall be binding on both parties to the 1995 AOC, as modified by this Agreement."

(k) Section XIX is deleted and replaced with the Indemnification provision set forth below:

XIX. INDEMNIFICATION

1. Puma shall indemnify, save and hold harmless the United States, its officials, agents, contractors, subcontractors, employees, and representatives from any and all claims or causes of action arising from, or on account of, negligent or other wrongful acts or omissions of Puma, its officers, directors, employees, agents, contractors, or subcontractors, in carrying out actions pursuant to the 1995 AOC as modified by this Agreement. In addition, Puma agrees to pay the United States all costs incurred by the United States, including but not limited to attorneys fees and other expenses of litigation, arising from or on account of claims made against the United States based on negligent or other wrongful acts or omissions of Puma, Puma's officers, directors, employees, agents, contractors, subcontractors and any persons acting on Puma's

behalf or under Puma's control, in carrying out activities pursuant to the 1995 AOC as modified by this Agreement. The United States shall not be held out as a party to any contract entered into by or on behalf of Puma in carrying out activities pursuant to the 1995 AOC as modified by this Agreement. Neither Puma nor any such contractor shall be considered an agent of the United States.

2. The United States shall give Puma notice of any claim for which the United States plans to seek indemnification pursuant to this Section and shall consult with Puma prior to settling such claim.

3. Puma waives all claims against the United States for damages or reimbursement or for set-off of any payments made or to be made to the United States, arising from or on account of any contract, agreement, or arrangement between Puma and any person for performance of any work on or relating to the Facility including, but not limited to, claims on account of construction delays. In addition, Puma shall indemnify and hold harmless the United States with respect to any and all claims for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between Puma and any person for performance of any work on or relating to the Facility, including, but not limited to, claims on account of construction delays.

(l) Section XXVII (*Force Majeure* and Excusable Delay) is deleted and replaced with the *Force Majeure* provision forth below:

XXVII. FORCE MAJEURE

1. Puma agrees to perform all requirements of the 1995 AOC as modified herein within the time limits established under the 1995 AOC as modified herein, unless the performance is delayed by a *force majeure* event. For purposes of the 1995 AOC as modified herein, a *force majeure* event is defined as any event arising from causes beyond the control of Puma, or of any entity controlled by Puma, including but not limited to its contractors and subcontractors, which delays or prevents performance of any obligation under the 1995 AOC as modified herein despite Puma's best efforts to fulfill the obligation. A *force majeure* event does not include financial inability to complete the Work, or increased cost of performance, or a failure to attain approved performance standards/action levels/cleanup standards and/or otherwise meet substantive requirements mandated by the 1995 AOC as modified herein.

2. If any event occurs or has occurred that may delay the performance of any obligation under the 1995 AOC as modified herein, whether or not caused by a *force majeure* event, Puma shall notify EPA orally within five (5) calendar days of when Puma first knew that the event might cause a delay. Within fifteen (15) calendar days thereafter, Puma shall provide to EPA in writing an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; Puma's

rationale for attributing such delay to a *force majeure* event if it intends to assert such a claim; and a statement as to whether, in the opinion of Puma, such event may cause or contribute to an endangerment to public health, welfare or the environment. Failure to comply with the above requirements, unless extended by EPA, shall preclude Puma from asserting any claim of *force majeure* for that event for the period of time of such failure to comply and for any additional delay caused by such failure.

3. If the delay or anticipated delay is attributable to a *force majeure* event, the time for performance of the obligations under the 1995 AOC as modified herein that are affected by the *force majeure* event will be extended by EPA for a period of time equal to the delay resulting from such circumstances. An extension of the time for performance of the obligations affected by the *force majeure* event shall not, of itself, extend the time for performance of any other obligation. If EPA does not agree that the delay or anticipated delay has been or will be caused by a *force majeure* event, EPA will notify Puma in writing of its decision. If EPA agrees that the delay is attributable to a *force majeure* event, EPA will notify Puma in writing of the length of the extension, if any, for performance of the obligations affected by the *force majeure* event.

4. If the parties do not agree that any delay or failure has been or will be caused by a *force majeure* event, or it if there is no agreement on the length of the extension, Puma may elect to invoke the dispute resolution procedures in the 1995 AOC as modified herein. In any such proceeding, Puma shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a *force majeure* event, that the duration of the delay of the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the effects of the delay, and that Puma complied with all the requirements set forth herein for *force majeure* events.

To the extent there are any inconsistencies between the 1995 AOC and this Agreement, the provisions of this Agreement shall control. The parties acknowledge that i) local laws; ii) EQB regulations; and/or iii) other agreements Puma and EPA are entering into with respect to the Facility in conjunction with Puma's purchase of the Facility may possibly apply to aspects of work involving the same areas of the Facility or to aspects of the work requirements under the AOC as modified herein for the Facility. To the extent Puma identifies conflicting obligations stemming from the requirements set forth in the 1995 AOC as modified herein and that of local laws, EQB regulation and/or any other agreements entered into between the parties in conjunction with Puma's purchase of the Facility, Puma, within ten days of identifying any potential conflict, shall notify EPA in writing, detailing the potential conflict and proposing a course of action. Puma shall not be in default of, or subject to the stipulated penalties set forth in, the 1995 AOC as modified herein for failure to comply with the obligations in the 1995 AOC as modified herein if such failure is due to the existence of conflicting obligations provided that EPA determines that Puma timely identified any of the above referenced inconsistent obligations and pursued resolution of the conflict in good faith.

In signing this Agreement with New Purchaser – Puma Energy Caribe, LLC., Puma affirms that it has read, understands and consents to all of the terms and conditions set forth in the 1995 AOC and this Agreement, which modifies the 1995 AOC. The signatories below hereby certify that they are fully authorized to enter into the terms and conditions of the 1995 AOC as modified by this Agreement on behalf of Puma.

Robert Michael Jones
Authorized Representative
Puma Energy Caribe, LLC.

5/4/11
Date

Duncan Alexander Armstrong-Prior
Authorized Representative
Puma Energy Caribe, LLC.

5/4/11
Date

Carl Soderberg
Director
Caribbean Environmental Protection Division
Region 2
United States Environmental Protection Agency

Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II

Corrective Action Order

IN THE MATTER OF:	
CARIBBEAN PETROLEUM, CORPORATION	ADMINISTRATIVE ORDER ON CONSENT
BAYAMON, PUERTO RICO	
EPA I.D. No. PRD000632182	DOCKET No. II RCRA-95-3008(h)-0303
RESPONDENT	Proceeding under Section 3008(h) of the Resource Conservation and Recovery Act, as amended.

I. Preliminary Statement

1. This Administrative Order on Consent ("Order") is being issued to Caribbean Petroleum Corporation ("CPC" or "Respondent"), pursuant to the Resource Conservation and Recovery Act of 1976 ("RCRA"), as amended by the Hazardous and Solid Waste Amendments of 1984 ("HSWA"), codified at 42 U.S.C. § 6901 et seq. ("the Act").

2. Section 3008(h) of the Act, 42 U.S.C. § 6928(h), authorizes the Administrator of the United States Environmental Protection Agency ("EPA") to issue an order requiring corrective action, or such other response which she deems necessary to protect human health or the environment, if, on the basis of any information, she determines that there is or has been a release of hazardous waste or hazardous constituents into the environment from a facility that is or was authorized to operate under Section 3005(e) of the Act, 42 U.S.C. § 6925(e). The authority vested in the Administrator has been delegated to the Regional Administrator by EPA Delegation Number 8-31, dated April 16, 1985. This authority has been further delegated by the Regional Administrator of EPA, Region II, to the Director of the Air and Waste Management Division of EPA, Region II, by Region II Delegation Number 8-32, effective July 1, 1987.

3. This Consent Order is issued by the Director of the Air and Waste Management Division, EPA Region II, pursuant to Section 3008(h) of RCRA, 42 U.S.C. § 6928(h).

4. To effectuate the mutual objectives of EPA and Respondent, the Respondent agrees to undertake all actions required by the terms and conditions of this Consent Order, and consents to and will not contest the terms of this Order. Except as otherwise specifically provided for in this Consent Order, neither failure to contest this Order, nor Respondent's actions in complying with the terms of this Order, shall be construed as an admission of any fact(s) or law contained in this Order.

II. Parties Bound

1. For the purposes of this Consent Order, the term "Parties" shall be defined as the United States Environmental Protection Agency, Region II and Caribbean Petroleum Corporation located in Bayamon, Puerto Rico.

2. This Order, and the responsibilities and obligations it imposes, shall apply to and bind the Respondent, its present and future officers, directors, officials, agents, servants, trustees, receivers, successors, and/or assigns, as well as all other persons including, but not limited to, firms, corporations, subsidiaries, contractors, independent contractors, subcontractors, or consultants who act for, are owned by, or are in an agency relationship with the Respondent, and/or who conduct, monitor or perform any work pursuant to or required by this Order.

3. Regardless of Respondent's employ of, contractual agreement and/or relationship with, any entity named in paragraph 2 of this section, the Respondent remains ultimately liable for failure to carry out, or comply with, any term or condition imposed by this Order.

4. All contractual agreements entered into by Respondent aimed at satisfying its responsibilities or obligations under this Order shall strictly comply with the terms and conditions of this Order. In addition, Respondent shall, within one week of the effective date of this Order and/or immediately, upon hiring, provide a copy of this Order, and any relevant attachments, to all contractors, subcontractors, laboratories, consultants, or any entity retained to conduct, monitor or perform any work pursuant to this Order.

5. Respondent shall give notice, and a copy, of this Order to any successor in interest prior to any transfer of ownership or operation of the "facility" (as defined in Section IV.3 and 6.

below) and shall notify EPA's designated contact, in writing, of the transfer thirty (30) days prior to any such transfer.

6. No change in the Respondent's corporate form or in the ownership of the facility or its assets shall in any way alter or alleviate Respondent's responsibility and obligation to carry out all the terms and conditions of this Order.

III. Statement of Purpose

This Order is being issued to protect human health and the environment from releases of "hazardous waste" and/or "hazardous constituents", as defined by Section 1004(5) of the Act, 42 U.S.C. § 6903(5), 40 C.F.R. §§ 260.10, 261.3, and/or 40 C.F.R. Part 261 Appendix VIII, at or from Respondent's Facility. The Order requires, at a minimum, the performance by Respondent of Interim Measures, a RCRA Facility Investigation ("RFI") to determine fully the nature and extent of any release(s) of hazardous waste and/or hazardous constituents from the facility into the environment, and to gather necessary data to support the Corrective Measures Study, if one is deemed necessary, pursuant to this Order.

If EPA determines that corrective measures, in addition to Interim Measures to be implemented at the facility, are necessary, the Respondent shall conduct a Corrective Measures Study ("CMS") to develop and evaluate one or more corrective measure alternatives and to recommend a final corrective measure or measures. This Order does not require Corrective Measures Implementation (CMI). However, if a CMI is appropriate, such measures shall be either incorporated into a post-closure permit, a new Order, or a modification of this Order.

IV. EPA's Findings of Fact

1. Respondent is a Corporation:

Respondent is Caribbean Petroleum Corporation ("CPC"), a private corporation authorized to do business in the Commonwealth of Puerto Rico.

2. Respondent is a Person:

Respondent is a "person" as defined by Section 1004(15) of the Act, 42 U.S.C. § 6903(15) and in 40 C.F.R. § 260.10.

3. Respondent is the Owner and Operator:

Respondent is the "owner and operator" of the CPC "facility" ("the facility") located on State Road #28, Km. 2, Urb. Industrial Luchetti, Bayamon, Puerto Rico, 00619, as those terms are defined in 40 C.F.R. § 260.10.

4. Notifications/Part A Permit Applications:

Pursuant to Section 3010 of the Act, 42 U.S.C. § 6930, on August 5, 1980 Respondent's predecessor notified EPA that it generates "hazardous waste," as that term is defined in Section 1004(5) of RCRA, 42 U.S.C. § 6903(5) and 40 C.F.R. § 261.3, at the facility. On November 5, 1980, Respondent's predecessor filed a Part A permit application with EPA thereby qualifying for interim status. On February 2, 1982, Respondent's predecessor requested the withdrawal of its Part A application and interim status claiming it had been a "protective filer." EPA never made a determination that Respondent's predecessor was a protective filer.

In 1989, Respondent notified EPA by letter that it was the new owner/operator of the facility. On September 24, 1990, Respondent submitted a revised Notification of Hazardous Waste Activity form notifying EPA of its hazardous waste activity, as well as a Part A permit application. In this notification, Respondent identified itself as a generator of hazardous wastes, as well as the owner and operator of a hazardous waste treatment, storage, or disposal facility (TSD). Respondent submitted the notification and Part A due to the September 25, 1989 promulgation of the Toxicity Characteristics Rule which classified waste managed in the facility's equalization basin as EPA Hazardous Waste Number D018. (The equalization basin waste, when subjected to the Toxicity Characteristic Leaching Procedures, resulted in exceedence of 0.5 mg/l for benzene). 40 C.F.R. § 261.24.

On May 1, 1991 Respondent submitted to EPA a revised Part A application due to a new hazardous waste listing for petroleum sludge that further classified the waste managed in the facility's equalization basin as EPA Hazardous Waste Number F037.

On September 25, 1991, Respondent lost interim status, pursuant to Section 3005 of RCRA, for management of hazardous waste in the equalization basin because Respondent did not adequately certify that it is in compliance with all applicable groundwater monitoring and financial assurance requirements.

5. Interim Status:

Pursuant to Section 3005(e) of the Act, 42 U.S.C. § 6925, and 40 C.F.R. §§ 270.1(b) and 270.70(a), Respondent received "interim status" with the timely submission of its:

a) Section 3010 notification; and

b) Part A of the Permit Application

Interim status facilities are subject to the regulations promulgated pursuant to Sections 3004 and 3005 of the Act, 42 U.S.C. §§ 6924 and 6925, which were codified in 40 C.F.R. Parts 260-265, 268, and 270.

6. Facility Description:

The Caribbean Petroleum Corporation (CPC) facility is a 179 acre facility located in the Luchetti Industrial Park in Bayamon, Puerto Rico. The facility, formerly called Caribbean Refining Corporation, began operation in 1955. In 1962, Gulf Oil Corporation purchased the facility and the name was changed to Caribbean Gulf Refining Corporation. Chevron Corporation purchased all the assets of Gulf Oil Corporation in 1984. In September 1987, Chevron Corporation sold all of its assets in Puerto Rico to First Oil International. The refinery was temporarily shut down in February, 1988 until the last quarter of 1989. In 1989 CPC informed the EPA that it was the new owner.

The refinery produces fuel oils, petroleum distillates, fuel gases, diesel oil, kerosene, unleaded gasoline, residual oil #5 and #6, and asphalt. Lead gasoline production ceased in 1988. Crude oil is brought to the refinery via pipeline from the dock facility located on the San Juan Bay. The crude oil is then stored in tanks on site until processing. The refining processes include two crude distillation units which process crude oil to produce unleaded gasoline, distillate, gas oil and reduced crude oil. Vacuum distillation units remove lighter materials and heavier materials are utilized to manufacture asphalt and different fuel oils. A fluid catalytic cracking unit is utilized for the production of gas, gasoline, distillate and light fuel oils. A Catalytic Reforming Unit produces high octane fuels while a Hydrotreating unit reduces the sulfur content of the distillate, which is stored and sold as diesel fuel. An Amine Treatment unit cleans refinery gases while sulfur is recovered from the resultant acid gas to be sold.

The hazardous wastes generated at the plant include DAF Float (K048), slop oil emulsion solids (K049), heat exchanger bundle cleaning sludge (K050), API Separator sludge (K051), unleaded tank bottoms (D001), spent phosphoric acid catalyst (D002), and reactive waste (D003). These hazardous waste are sent off-site for treatment and disposal. Respondent also generates wastewater treatment sludge (F038 hazardous waste) which it formerly managed in a surface impoundment, but now manages in a tank system.

The CPC facility also operates an underground recovery system that recovers both free product, which are hydrocarbons, and potentially contaminated ground water.

7. Geologic and Hydraulic Conditions:

The geology of the site consists of two general lithologic units: clay overburden and limestone. The clay overburden varies in thickness from 10 feet along the southern perimeter of the refinery to 90 feet on the northern perimeter. The clay overburden contains a shallow unconfined water-bearing zone. The limestone beneath the facility dips to the north and exhibits distinctive karst features common to the area: mogotes, small solution features, and undulatory surfaces. The limestone contains the aquifer, which is confined. The potentiometric surface of the limestone aquifer is somewhat lower than the water table and slopes toward the north.

The depth to the water in the uppermost aquifer beneath the facility ranges from approximately 2.5 to 13.5 feet below ground level. The major surface water body nearest the CPC facility is Las Lajas Creek which is channeled through a concrete conduit underground and routed along the western and northern portions of the site. This creek returns to an open channel at a point north of the refinery's wastewater treatment facilities, where the site's effluent and storm water are discharged under a NPDES permit. The creek flows northward toward San Juan Bay located approximately two miles to the north-northwest from the site.

8. Evidence of Releases:

a. Five hazardous constituents--benzene, toluene, chromium, mercury, and lead--have been detected in the ground water beneath a portion of Respondent's facility. Benzene, lead, mercury, and chromium have been detected at levels at or above the health-based levels or maximum contaminant levels ("MCLs") for these constituents. Specifically, the MCL (in ground water) for benzene is 5.0 parts per billion ("ppb"), lead is 50.0 ppb, mercury is 2.0 ppb, and chromium is 50.0 ppb. See 55 Fed. Reg. 30798, 30868 (July 27, 1990). As of the issuance of this Order, a health-based level or MCL for toluene has not been published.

The following ground water monitoring wells at the facility, indicate the presence of benzene and toluene in the ground water: MW14B, MW75B, MW76B, and MW77B. Concentrations range from 4.0 ppb to 147.0 ppb for benzene and 13.0 ppb to 56.0 ppb for toluene. The following monitoring wells indicate the presence of lead in the ground water: MW14B, MW18D, MW20B, MW21B,

MW75B, and MW77B. Concentrations range from 1.0 ppb to 50 ppb. [Reference: Assessment of Hydrocarbons in Ground Water at the CARECO Refinery, Bayamon, Puerto Rico, June 1990, prepared by Chevron.]

The ground water monitoring system installed for the Equalization Basin indicated the presence of chromium, mercury, and lead. Chromium (dissolved form) was detected in wells EB-102 (0.121 ppm), EB-103 (0.149 ppm), EB-104 (194.0 ppm), and EB-105 (124.0 ppm). Mercury was detected in well EB-102 (0.0028 ppm). Lead was detected in well EB-103 (0.125 ppm). [Reference: Quarterly Groundwater Monitoring Report for 1992 submitted by CPC.]

Free product/groundwater recovery wells in the following areas indicate the presence of hydrocarbons (which contain benzene, toluene, chromium, mercury, and/or lead):

- AOC #12 - Old Gasoline Loading Rack Area--[Well 48B]
- LPG Tank Area--[Well 52B]
- Intersection of Avenue D and 5th Street--[Well 34A]
- Intersection of Avenue D and Sixth Street--[Well 60A]
- Avenue C between 4th and 5th Streets--[Well 43B]

[Reference: Assessment of Hydrocarbons in Ground Water at the CARECO Refinery, Bayamon, Puerto Rico, June 1990, prepared by Chevron.]

b. The RCRA Facility Assessment Report dated March 1989, identified 12 solid waste management units (SWMUs) and 11 areas of concern (AOCs) with evidence of past releases of hazardous waste and/or constituents to soil. These are listed below:

- SWMU #1 - Container Storage Area
- SWMU #2 - Slop Oil Tank 1000
- SWMU #3 - Slop Oil tank 1001
- SWMU #4 - Solids Knockout Pit
- SWMU #5 - Surge Tank ET-1
- SWMU #6 - API Separator
- SWMU #7 - Corrugated Plate Interceptor
- SWMU #8 - Equalization Basin
- SWMU #9 - Inlet Basin to Biological Reactor #1
- SWMU #10 - Digester
- SWMU #13 - Slop Oil Tank 452
- SWMU #19 - Natural Aeration Basin
- AOC #1 - Crude Unit Charge Pump

- AOC #2 - Fuel oil Transfer Pump (Cummins) Area
- AOC #3 - Fuel Oil Transfer Pump Area near Tank 603
- AOC #4 - Asphalt Heater Unit
- AOC #5 - Fuel Oil Loading Rack Pump Area
- AOC #6 - Debutanizer Reboiler Area
- AOC #7 - FCC Unit Compressor Lube System Area
- AOC #8 - Heat Exchanger Bundles at Heavy Cycle Steam Generator
- AOC #9 - Crude Unit #1 Area
- AOC #10 - Crude Unit #1 near Heat Exch. Bundle Area
- AOC #11 - Fuel Oil Pipeline Spill Areas

9. SWMUs With Potential for Releases

Known SWMUS at which there is a potential for release:

- SWMU #11 - Old Oil Lagoons
- SWMU #12 - Old East Separator
- SWMU #32 - Old landfill
- SWMU #33 - Nonhazardous disposal site
- SWMU #34 - Sulfur Lagoon
- SWMU #35 - Catalytic waste pond
- SWMU #36 - Lagoon
- SWMU #37 - Sulfur Drum Storage Area
- SWMU #38 - Centrifuge
- SWMU #39 - Gravity Thickener
- SWMU #40 - Scrap Metal Yard

See Attachment I to this Order for the locations of these SWMUs and AOCs.

10. Need to Protect Human Health and Environment:

Below are some of the health effects associated with some of the hazardous constituents detected in the ground water and/or soil at Respondent's facility.

a. Benzene is toxic by inhalation, ingestion, subcutaneous, and intraperitoneal routes. It affects the central nervous system and blood system. It is a narcotic and is a human carcinogen (myeloid leukemia). It has a strong irritating effect, producing, erythema and burning, and, in more severe cases, edema and blistering. The anesthetic action of benzene consists of a preliminary stage of excitation followed by depression and, under continued expose, death through respiratory failure. [Reference: Hazardous Chemicals Desk Reference, N. Irving Sax/Richard J. Lewis, Sr., 1987.]

b. Toluene is toxic by inhalation, ingestion, and subcutaneous routes. It is a poison by intraperitoneal route and is a carcinogen. It is a skin and eye irritant and has human central nervous system and psychotropic effects. In the case of acute poisoning, the effect has been that of a narcotic, the victim passing through a stage of intoxication into one of coma. In the case of chronic poisoning, anemia and leucopenia, with a biopsy showing bone marrow hypoplasia has been reported. [Reference: Hazardous Chemicals Desk Reference, N. Irving Sax/Richard J. Lewis, Sr., 1987.]

c. Lead is a poison by ingestion. It affects the central nervous system. It is a carcinogen of the lungs and kidneys. [Reference: Hazardous Chemicals Desk Reference, N. Irving Sax/Richard J. Lewis, Sr., 1987.]

d. Chromium is toxic. Certain chromium compounds are carcinogens. Targets include blood, lungs, respiratory system, liver, kidneys, eyes, and skin. Dermal contact can cause primary irritation and ulceration as well as allergic eczema. Inhalation can cause nasal irritation and septal perforation. Pulmonary irritation, bronchogenic carcinoma may result from breathing chromate dust. Ingestion may lead to severe irritation of the gastrointestinal tract, circulatory shock and renal damage. [Reference: The Merck Index, Eleventh Edition, Merck & Co., Inc., Rahway, N.J. 1989]

e. Lead is toxic. It is most common in young children with a history of pica. It may induce increased intracranial pressure and cause anorexia, vomiting, malaise, and convulsions. [Reference: The Merck Index, Eleventh Edition, Merck & Co., Inc., Rahway, N.J. 1989]

f. Mercury is toxic and is readily absorbed via respiratory tract (elemental mercury vapor and mercury compound dusts), skin, and gastrointestinal tract. Certain mercury salts have violent corrosive effects on skin and mucous membranes, severe nausea, vomiting, abdominal pain, bloody diarrhea, kidney damage, and death. Chronic toxicity includes muscle tremors, depression, irritability, and nervousness. [Reference: The Merck Index, Eleventh Edition, Merck & Co., Inc., Rahway, N.J. 1989]

11. Exposure Pathways:

The exposure pathways for the releases identified at the facility are the following:

a. Soils. Hazardous constituents in the soil may migrate off-site either through run-off to surface water bodies or through leaching into the groundwater. In addition, there is a potential for direct contact by workers at the facility, direct contact by off-site exposure to soils contaminated by run-off, or wind dispersal of surface soils.

b. Surface Water. The major surface water body nearest the CPC facility is Las Lajas Creek which was channeled through a concrete conduit underground and routed along the western and northern portions of the site. This creek returns to an open channel at a point north of the refinery's wastewater treatment facilities.

c. Ground Water. Hazardous constituents in the ground water may migrate to the nearest surface water body, Las Lajas Creek, which discharges to San Juan Bay.

d. Air. Volatile hazardous constituents in the soil, surface water, or ground water can volatilize into the air, promoting inhalation and direct contact of hazardous constituents. In addition, re-deposition of hazardous constituents can occur through wind dispersal of contaminated surface soils.

V. EPA's Determinations and Conclusions of Law

Based on the Findings of Fact above, and the entire administrative record, the Director of the Air and Waste Management Division, EPA Region II, has determined as a matter of law, that:

1. Respondent is a "person" as defined by Section 1004(15) of the Act, 42 U.S.C. § 6903(15).

2. Respondent is the "owner" and "operator" of a "facility" that presently "generates" and "stores" and in the past has "disposed" of "hazardous waste," as those terms are defined in Section 1004 of the Act and/or 40 C.F.R. § 260.10.

3. Respondent's facility was authorized to operate as an interim status facility pursuant to Section 3005(e) of the Act, 42 U.S.C. § 6925(e).

4. Certain wastes found at Respondent's facility are hazardous wastes and/or hazardous constituents as those terms are defined by Section 1004(5) of the Act, 42 U.S.C. § 6903(5) and 40 C.F.R. §§ 260.10, 261.3 and Appendix VIII of 40 C.F.R. Part 261.

5. There is or has been a release of hazardous wastes and/or hazardous constituents to the environment from the Respondent's facility; and

6. The actions required to be taken pursuant to this Order are necessary to protect human health and/or the environment.

VI. Order: Work to be Performed:

Pursuant to Section 3008(h) of the Act, 42 U.S.C. §6928(h), Respondent is hereby ordered to perform the tasks and follow the schedule set forth in and established pursuant to the terms of this Order. All work undertaken pursuant to this Order shall be performed in a manner consistent and in accordance with the specifications of the plans, reports and schedules approved by EPA. Attachments I, II, III are incorporated by reference into the Order.

1. RCRA Facility Investigation (RFI).

a. RFI Workplan

Within one hundred and eighty (180) calendar days after the effective date of this Order, the Respondent shall submit a RFI Workplan to fully determine the nature and extent of any release of hazardous waste and/or hazardous constituents from the facility. The workplan, at a minimum, shall focus on all the units and areas identified in paragraphs 1 and 2 immediately below:

1) Known SWMUs, AOCs, and other areas at which there are known releases:

- AOC #12 - Old Gasoline Loading Rack Area
- LPG Tank Area (hydrocarbon release)
- Intersection of Avenue D and 5th Street (hydrocarbon release)
- Intersection of Avenue D and Sixth Street (hydrocarbon release)
- Avenue C between 4th and 5th Streets (hydrocarbon release)
- SWMU #1 - Container Storage Area
- SWMU #2 - Slop Oil Tank 1000

- SWMU #3 - Slop Oil tank 1001
- SWMU #4 - Solids Knockout Pit
- SWMU #5 - Surge Tank ET-1
- SWMU #6 - API Separator
- SWMU #7 - Corrugated Plate Interceptor
- SWMU #8 - Equalization Basin
- SWMU #9 - Inlet Basin to Biological Reactor #1
- SWMU #10 - Digester
- SWMU #13 - Slop Oil Tank 452
- SWMU #19 - Natural Aeration Basin
- AOC #1 - Crude Unit Charge Pump
- AOC #2 - Fuel oil Transfer Pump (Cummins) Area
- AOC #3 - Fuel Oil Transfer Pump Area near Tank 603
- AOC #4 - Asphalt Heater Unit
- AOC #5 - Fuel Oil Loading Rack Pump Area
- AOC #6 - Debutanizer Reboiler Area
- AOC #7 - FCC Unit Compressor Lube System Area
- AOC #8 - Heat Exchanger Bundles at Heavy Cycle Steam Generator
- AOC #9 - Crude Unit #1 Area
- AOC #10 - Crude Unit #1 near Heat Exch. Bundle Area
- AOC #11 - Fuel Oil Pipeline Spill Areas

2) Known SWMUS at which there is a potential for release:

- SWMU #11 - Old Oil Lagoons
- SWMU #12 - Old East Separator
- SWMU #32 - Old landfill
- SWMU #33 - Nonhazardous disposal site
- SWMU #34 - Sulfur Lagoon
- SWMU #35 - Catalytic waste pond
- SWMU #36 - Lagoon
- SWMU #37 - Sulfur Drum Storage Area
- SWMU #38 - Centrifuge
- SWMU #39 - Gravity Thickener
- SWMU #40 - Scrap Metal Yard

3) Pursuant to a schedule approved by EPA, the RFI Workplan shall be amended to incorporate any additional work required pursuant to Section VII of this Order.

b. Scope of Work.

The RFI Workplan shall, at a minimum, address all applicable requirements specified in Task I through VII

of the Scope of Work for a RCRA Facility Investigation, included as Attachment II to this Order.

Respondent shall perform the following tasks in accordance with Attachment II:

1) Task I--Description of Current Conditions: This task shall be completed and submitted as part of the RFI Workplan in accordance with Attachment II.

2) Task II--Pre-Investigation Evaluation of Corrective Measure Technologies: This task shall be completed and submitted as part of the RFI Workplan in accordance with Attachment II.

3) Task III--RFI Workplan Requirements: The RFI Workplan shall address the requirements described in Task III of Attachment II and those requirements designed to gather the data and information described in Task IV of Attachment II to this Order.

4) Task IV--Facility Investigation: Respondent shall complete Task IV in Attachment II in accordance with the schedule in the approved RFI Workplan.

5) Task V--Investigation Analysis: Respondent shall conduct an investigation analysis in accordance with Task V in Attachment II. Task V shall be completed in accordance with the schedule in the approved RFI Workplan.

6) Task VI--Laboratory and Bench Scale Studies: Respondent shall conduct Task VI in accordance with Attachment II and provide a schedule for submittal of the results of Task VI or provide justification why Task VI is not needed. This schedule or justification that Task VI is not needed shall be submitted with the draft RFI Report.

7) Task VII--Reports to be submitted during the RFI phase: Respondent shall comply with the requirements of Task VII of Attachment II to this Order from the effective date of this Order until its termination and satisfaction.

c. RFI Report and Summary Report

1) Within ninety (90) calendar days after completion of the Facility Investigation and Investigation

Analysis (Tasks IV and V of Attachment II), the Respondent shall submit a RFI Report and a RFI Summary Report, which are considered to be draft.

The draft RFI Report shall describe the procedures, methods, and results of all facility investigations of SWMUs and other areas and their releases, including information on the type and extent of contamination at the facility, sources and migration pathways, and actual or potential receptors. The RFI Report shall present all information gathered under the approved RFI Workplan. The RFI Report must contain adequate information to support further corrective action decisions at the facility.

The RFI Summary Report shall describe more briefly the procedures, methods, and results of the RFI.

2) Respondent shall develop the final RFI Report, which shall incorporate changes responsive to EPA's comments on the draft RFI Report and RFI Summary Report. The final RFI report shall be developed and submitted to EPA within the time frame established by EPA in its cover letter transmitting EPA's comments on the Draft RFI Report.

d. If any of the items required by Task III through V of Attachment II have already been submitted or completed, the Respondent, for those items, may instead provide the following in the RFI workplan: (1) a description of the items and/or summary of findings, and (2) description of investigations addressing the items, documents/reports of the investigations with dates, and summary of the findings. Respondent shall provide copies of any document/report to EPA upon request. EPA will determine the adequacy and/or the extent to which prior submissions or completions may satisfy specific items required by this Order.

e. Respondent shall provide written justification for any omissions or deviations from the minimum requirements of Attachment II. Any such omission or deviation must be approved by EPA.

f. Guidance to be Used in Conducting RFI

The RFI shall be implemented in accordance with the Act, its applicable implementing regulations and EPA guidance documents, including, but not limited to, the following: 1) RCRA Facility Investigation (RFI) Guidance, (EPA publication 530/SW-89-031); 2) RCRA Ground-water Monitoring Technical Enforcement Guidance Document, (Office of Solid Waste and Emergency Response Directive 9950.1, September 1986); and 3) Test Methods for Evaluating Solid Waste (EPA publication SW-846, as amended).

2. Corrective Measures Study (CMS):

a. CMS Workplan

Within sixty (60) calendar days of receipt of EPA's written approval of the final RFI Report and a statement by EPA that a CMS is necessary, Respondent shall submit a draft CMS Workplan for EPA's approval. The purpose of the CMS is to develop and evaluate corrective measures to remediate any contamination at the facility.

b. The CMS Workplan shall include, at a minimum, the following:

1) a description of the general approach to investigating and evaluating potential remedies;

2) a definition of the overall objectives of the study;

3) the specific plans for evaluating remedies to ensure compliance with remedy standards;

4) the schedule for conducting the study;

5) the proposed format for the presentation of information; and

6) Tasks I through III set forth in Attachment III to this Order.

c. Respondent shall develop the final CMS Workplan, which shall incorporate changes responsive to EPA's comments, if any, on the draft CMS Workplan. The final CMS Workplan shall be developed and submitted to EPA within the time frame established by EPA in its cover letter transmitting EPA's comments on the Draft CMS Workplan.

d. CMS Implementation

1) No later than thirty (30) calendar days after the Respondent has received written approval from EPA for the CMS Workplan, Respondent shall implement the CMS Workplan in accordance with the schedules specified in the CMS Workplan.

2) Respondent shall conduct the following Tasks in accordance with the terms and schedules of the approved CMS Workplan, as well as the terms of this Order:

a) Task I--Identification and Development of the Corrective Measure Alternative or Alternatives: Respondent shall conduct Task I in accordance with Attachment III to this Order. The results from this Task shall be included in the CMS Report discussed below.

b) Task II--Evaluation of the Corrective Measure Alternative or Alternatives: Respondent shall conduct Task II in accordance with Attachment III. The results from this task shall be included in the CMS Report discussed below.

c) Task III--Justification and Recommendation of the Corrective Measures: Respondent shall conduct Task III in accordance with Attachment III. The results from this task shall be included in the CMS Report discussed below.

e. CMS Report

1) Within sixty (60) calendar days after the completion of the CMS, Respondent shall submit a draft CMS Report in accordance with the requirements of Task IV of Attachment III. The draft CMS Report shall present all information gathered under the approved CMS Workplan. The draft CMS Report shall summarize the results of the investigations for each remedy studied and of any bench-scale or pilot tests conducted. The draft CMS Report must include an evaluation of each remedial alternative and the Respondent's recommended alternative and its justification.

2) Based on preliminary results and/or the draft CMS Report, EPA may require Respondent to evaluate additional remedies or particular elements of one or more proposed remedies.

3) Respondent shall develop the final CMS Report, which shall incorporate changes responsive to EPA's comments on the draft CMS Report within the time frame established by EPA in its letter transmitting the comments on the Draft CMS Report.

f. Corrective Measure Alternative Selection

1) Based on the results of the CMS and any further evaluations of additional remedies under this study, EPA shall select a corrective measure from the corrective measure alternatives evaluated in the CMS that will

a) be protective of human health and the environment;

b) meet the concentration levels of hazardous constituents in each medium that the remedy must achieve to be protective of human health and the environment;

c) control the source(s) of release(s) so as to reduce or eliminate, to the maximum extent practicable, further releases that might pose a threat to human health and the environment; and

d) meet all applicable waste management requirements.

2) The selection of corrective measure alternative (or remedy) shall be subject to public participation as appropriate.

3) Upon completion of the public participation procedures and EPA's evaluation of the public comments, EPA shall notify Respondent of its determination on corrective measure(s).

3. Process Sewers Assessment

a. Within ninety (90) calendar days from the effective date of this Order, Respondent shall submit to EPA a draft Process Sewers Assessment Plan. See recommended guidance, Handbook--Sewer System Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030. The Process Sewers Assessment Plan shall be designed to identify past releases and current releases of hazardous waste and/or hazardous constituents along the process sewer lines and include a schedule for implementing the plan and submitting the results in a report to be titled Process Sewers Assessment Report. See 4.c below.

b. Respondent shall develop a revised Process Sewers Assessment Plan, which shall incorporate changes responsive to EPA's comments, if any, on the draft Process Sewers Assessment Plan. The revised Process Sewers Assessment Plan shall be developed and submitted to EPA within the time frame established by EPA in its cover letter transmitting EPA's comments on the draft Process Sewers Assessment Plan.

c. Upon receipt of written approval from EPA of the Process Sewers Assessment Plan, Respondent shall implement the plan and submit the Process Sewers Assessment Report in accordance with the schedule in the approved plan.

The Process Sewers Assessment Report shall include, at a minimum, the following information:

1) The location of process sewers on a facility diagram and their relative location to the SWMUs, AOCs, and areas of known contamination;

2) The general dimensions, capacities, structural description of the system (supply any available drawings), joints and fittings, and maintenance/repair records and protocols;

3) The period during which the process sewers were operated;

4) The specifics on all hazardous wastes and hazardous constituents that have been or are being managed in the process sewers, to the extent available;

5) The results of any sampling and analysis required for the purpose of determining whether releases of hazardous wastes or hazardous constituents, have occurred, are occurring, or are likely to occur from the system;

6) Evidence of release(s) from the process sewers, such as cracks in piping, man-holes, joints, or fittings;

7) Evidence of sink-hole formation within 20 feet of the process sewer lines.

4. Assessment of Release to Las Lajas Creek

a. Within sixty (60) calendar days from the effective date of this Order, Respondent shall submit to EPA a draft Las Lajas Creek Assessment Plan. The Lajas Creek Assessment Plan shall be designed to identify the hazardous wastes and/or hazardous constituents released to the creek, to characterize the hydrology of the creek and its effect on ground water hydrology. CPC shall further determine the release potential from SWMUs #33, 34, and 35 (Nonhazardous Disposal Site, Sulfur Lagoon, and Catalytic Pond) to the creek pursuant to the RFI Workplan and the approved schedule therein.

The Las Lajas Creek Assessment Plan shall include, at a minimum, the following information:

- A sampling plan designed to identify any release of hazardous waste and/or hazardous constituents to the water and sediment of the creek from the wastewater treatment system; and

- Schedules for implementation of the plan and submittal of assessment report.

b. Respondent shall develop a revised Las Lajas Creek Assessment Plan, which shall incorporate changes responsive to EPA's comments, if any, on the draft Las Lajas Creek Assessment Plan. The revised Las Lajas Creek Assessment Plan shall be developed and submitted to EPA within the time frame established by EPA in its cover letter transmitting EPA's comments on the draft Las Lajas Creek Assessment Plan.

c. Upon receipt of written approval from EPA of the Las Lajas Creek Assessment Plan, Respondent shall implement the plan and submit the Lajas Creek Assessment Report in accordance with the schedule in the approved plan.

The Las Lajas Creek Assessment Report shall include, at a minimum, the following information:

- Characteristics of the creek hydrology and relation to ground water hydrology
- Sampling plan results
- Determination of whether there is an on-going release or past release of hazardous wastes and/or constituents.

The Las Lajas Creek Assessment Report shall be modified to include information regarding the impact and release potential of SWMUs 33, 34, and 35 on Las Lajas Creek upon CPC's scheduled completion of that portion of the RFI.

5. INTERIM MEASURES

a. Upon effective date of this Order, Respondent shall conduct the following interim measures:

1) Continue operation of product recovery system, as described in the Quarterly Report--Underground Recovery System, October - December 1991.

Respondent shall submit to EPA for review, in writing, any request for changes to the Underground Recovery System operation.

Upon EPA approval of requested changes, Respondent shall implement changes.

2) Continue monitoring the monitoring wells identified in the Quarterly Report--Underground Recovery System, October - December 1991, and determine the hazardous constituents in the ground water by including the hazardous constituents listed in the Target Compound List and the Target Analytes List ("TCL and TAL") in the ground water monitoring parameters until EPA revises the list of parameters.

The quarterly ground water monitoring reports shall be submitted to EPA within 45 calendar days following the end of each quarter (with the first quarter being from January to the end of March).

6. NEWLY-IDENTIFIED SOLID WASTE MANAGEMENT UNIT(S) AND NEWLY-DISCOVERED RELEASES

a. Notification Requirements for Newly Identified SWMUs

The Respondent shall notify EPA in writing of any newly-identified SWMUs (i.e., a unit or release not specifically identified by EPA by the time this Order is signed by EPA or listed in Section IV.8. or Attachment I), discovered during the course of ground-water monitoring, field investigations, interim measures, environmental audits, or other means, no later than fifteen (15) calendar days after its discovery.

b. Notification Requirements For Newly-discovered Releases

The Respondent shall notify EPA, in writing, of any release(s) of hazardous waste, including hazardous constituents, discovered during the course of groundwater monitoring, field investigation, environmental auditing, or other activities undertaken after the commencement of the RCRA Facility Investigation, no later than fifteen (15) calendar days after discovery.

7. Expedited Removal of Waste, Contaminated Material, and Contaminated Soil and Sediments (RCRA Stabilization Measures)

In situations where there are releases or potential for releases which if not addressed could result in further environmental degradation or where site/contamination characteristics lend themselves to effective measures designed to control or abate the spread of contamination, the Respondent may take remediation or removal action, for wastes, visibly impacted material, surface soil or surface sediments regardless of whether the wastes, visibly impacted material, surface soil or surface sediments are related to known releases from any of the SWMUs or AOCs at the facility.

a. Prior to taking such action, the Respondent must notify EPA of the situation. The notification must include, at a minimum:

   i. Locations of impacted areas;
   ii. Estimated amount of waste, material\media impacted;
   iii. Physical characteristics of the waste, material, soil, groundwater, sludge, or mixture;
   iv. Chemical characteristics that describe main chemical components in the waste, material, and/or media, based on information available to the Respondent;
   v. Description as to how waste, material, and/or media is to be remediated and\or disposed of.

b. Following consultation with EPA, if EPA approves the proposed expedited remedial action, Respondent shall, unless EPA indicates otherwise, submit to EPA for its approval a workplan for the implementation of such expedited remedial action. Upon approval by EPA, Respondent shall implement the action in accordance with the terms and schedules approved by EPA.

c. Within thirty (30) calendar days after the completion of the implementation of actions referenced above, the Respondent must submit to EPA a sampling plan. The purpose of a sampling plan will be to confirm that impacted areas have been remediated to the cleanup levels or to delineate the extent of further investigations for impacted areas. The sampling plan must conform to the requirements for sampling and analysis referenced in the Order and may be incorporated into other on-going investigations of the facility.

d. All transportation and disposal of waste and contaminated material, soil and sediments must comply with all applicable federal and commonwealth requirements.

VII. Additional Work

1. EPA may determine that additional investigations and/or studies of releases of hazardous waste and/or hazardous constituents, in addition to that detailed in this Order and its Attachments, is necessary to protect human health and/or the environment. Additional work shall be limited to: a) SWMUs and AOCs existing at the time the Order is signed by EPA but which are not identified in the Order and/or any releases, including future releases, from such SWMUs or AOCs; and b) releases from any new SWMUs and/or AOCs which come into existence after EPA's signing of the Order which impact the work identified in the Order. Respondent shall have the burden of demonstrating to EPA that: a) any newly identified SWMUs or AOCs did not exist prior to the date EPA signed the Order; or b) releases from any new SWMUs and/or AOCs which came into existence after EPA's signing of the Order have not, or will not, impact work under the Order.

2. If EPA determines any such additional work is necessary, it shall notify the Respondent in writing specifying the basis and reason for EPA's determination and the additional work deemed necessary (the "additional work notice"). Within fifteen days after Respondent's receipt of the additional work notice, Respondent shall either: a) begin implementation of the additional work in accordance with any schedule attached to the additional work notice; or b) if Respondent disagrees with EPA's determination that such additional work is necessary, Respondent shall submit a written Response setting forth all of its bases and reasons for disagreeing with EPA's determination and may request an opportunity to meet with EPA representatives to discuss such additional work. Based on EPA's review of Respondent's Response to the Additional Work Notice and any meeting discussing the same, EPA shall make a determination regarding the necessity of such additional work. If Respondent disagrees with this determination, it may invoke the dispute resolution procedures set forth in Section XXVIII. If the dispute resolution process determines additional work is necessary, Respondent shall submit a workplan for such work and perform such work in accordance with the standards, specifications, and schedules deemed necessary and approved by EPA.

3. All approved additional work performed by Respondent pursuant to this section shall be performed subject to and in a manner consistent with the terms and conditions of this Order. Any requirements for additional work shall be deemed to be incorporated into this Order as if fully set forth herein.

4. If EPA or Respondent identifies a current or imminent threat to human health or the environment, EPA may order Respondent to take immediate actions, pursuant to Section XIII of the Order, without the review/discussion process set forth above.

5. Any SWMU, AOC or release which does not fall within the confines of this Order, shall be addressed in either a post-closure permit, a new Order or a modification of this Order.

VIII. Minimum Qualifications for Directors and Supervisors

All work performed by the Respondent pursuant to this Order shall be under the direction and supervision of an individual(s) who has demonstrated expertise in hazardous waste site investigations and remediation. Before any work is performed, Respondent shall notify EPA in writing of the name, title, and qualifications of the supervisory personnel and contractors or subcontractors and their personnel to be used in carrying out the terms of this Order. In addition, the Respondent shall ensure that when a license is required, only licensed individuals shall be used to perform any work required by this Order.

IX. Project Coordinator/Information

1. On or before the effective date of this Order, EPA and Respondent shall each designate a Project Coordinator ("PC") and the name of at least one alternate who may function in the absence of the designated Project Coordinator. Both Project Coordinators shall be responsible for overseeing the implementation of this Order. The EPA Project Coordinator, or his designee, will be EPA's designated representative at the facility.

2. Unless otherwise specified in this Order, all communications between Respondent and EPA, and all documents, reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed to and through the respective Project Coordinators. Unless otherwise specified, reports, correspondence, approvals, disapprovals, notices, or other submissions relating to or required under this Order shall be in writing and originals or copies shall be sent to:

3 copies: Andrew Bellina, P.E.
Chief
Hazardous Waste Facilities Branch
U.S. EPA Region II
290 Broadway-22nd Floor
New York, N.Y. 10007-1866

1 copy: Carl-Axel Soderberg
EPA-Caribbean Field Office
Office 2A Podiatry Center Bldg.
1413 Fernandez Juncos Avenue
Santurce, Puerto Rico 00909

1 copy: Israel Torres
Land Pollution Control Area
Puerto Rico Environmental Quality Board
P.O. Box 11488
Santurce, Puerto Rico 00910

3. Each party shall provide at least five (5) days written notice prior to changing the Project Coordinator(s) and shall immediately provide written notification to all of the above addressees once a new Project Coordinator is selected.

X. Quality Assurance/Quality Control

1. All sampling, monitoring, analytical, and chain-of-custody plans shall be developed in accordance with the standards and recommended procedures contained in SW-846 - "Test Methods for the Chemical and Physical Analysis of Solid Waste", as amended, and the EPA Region II Quality Assurance Manual. Any deviations from these two documents must be accompanied by an appropriate justification and a demonstration of the effectiveness and applicability of the proposed alternative. EPA must approve the use of such alternatives in writing. The submission of such a justification shall not stay any compliance date in, or pursuant to, the Order.

2. Respondent shall inform the EPA Project Coordinator in advance which laboratories will be used by Respondent and ensure that EPA personnel and EPA-authorized representatives have access to the laboratories and personnel performing any analyses. In the event that EPA or its representatives cannot satisfactorily obtain access to the laboratories for any reason for the purposes of auditing protocols and technical proficiency, then EPA shall so inform the Respondent and the Respondent shall, within thirty (30) days, substitute another certified laboratory which provides access in a manner deemed satisfactory to EPA.

3. Respondent shall consult with EPA in planning for field sampling and laboratory analysis, including a description of the chain of custody procedures to be followed.

XI. EPA Approvals

1. Unless otherwise specified, EPA shall review any plan, report, specification or schedule submitted pursuant to, or required by this Order, and provide its written approval or, disapproval, with comments and/or modifications, to the Respondent. Unless otherwise specified by EPA, the Respondent shall submit a revised document within thirty (30) days of its receipt of EPA's written comments and/or modifications. Any such revised document submitted by the Respondent shall incorporate EPA's comments and/or modifications. EPA will then approve the revised document, or modify the document and approve it with any such modifications. The revised document, as approved by EPA, shall become final. All final approvals shall be given to the Respondent in writing.

2. Unless otherwise specified in the approved workplan, Respondent shall commence work within fourteen (14) days of receipt of EPA's written approval for each workplan developed pursuant to this Order. Any noncompliance with such EPA-approved plan, report, specification, or schedule shall be considered a violation of this Order.

3. Any reports, plans, specifications, or schedules, submitted pursuant to, or required by this Order, are hereby incorporated by reference into this Order following the date written approval of such document is given by EPA. Prior to this written approval, no plan, report, specification or schedule shall be construed as finally approved. Verbal advice, suggestions, or comments given by EPA representatives will not constitute an official approval, nor shall any verbal approval or verbal assurance of approval be considered binding.

XII. On-site and Off-site Access

1. Respondent shall permit EPA and EQB representatives, authorized designees, employees, agents, contractors, subcontractors, or consultants to enter and freely move about the facility for, but not limited to, the following purpose(s):

a) interviewing facility personnel, contractors (including subcontractors and independent contractors), or any other entity or individual responsible for implementing any aspect or portion of this Order;

b) inspecting records relating to the facility and this Order;

c) Conducting sampling, monitoring, or any other such activity which EPA or the Project Coordinator deems necessary;

d) using a camera, sound recording, video or any other documentary type equipment;

e) Verifying the reports and data submitted to EPA by the Respondent; and/or

f) determing compliance with RCRA, the regulations thereunder, and any other federal environmental law and/or regulation.

2. The Respondent shall make available to EPA, or any of the persons/entities identified in paragraph 1 of this section, for inspection, copying, or photographing, all records, files, photographs, documents, or any other writing, including monitoring and sampling data that pertain to any work undertaken pursuant to this Order, or the Act and the regulations promulgated thereunder.

3. To the extent that work required by this Order must be performed on property not owned or controlled by the Respondent, the Respondent shall use its best efforts to obtain a "Site Access Agreement" to perform such work within thirty (30) days of the date Respondent becomes aware or should be aware of a need to perform such work. Any such Access Agreement shall provide for reasonable access by EPA, EQB, and any of the persons/entities listed in paragraph 1 of this section. In the event that a Site Access Agreement is not obtained within the thirty-day period, the Respondent shall notify EPA, in writing, documenting its best efforts to obtain such agreements. Best efforts, as used in this paragraph, shall include, at a minimum:

a) A certified letter from the Respondent to the present owner of such property requesting permission to allow the Respondent, EPA and any of their authorized representative(s) access to such property or portion thereof; and

b) The property owner's response, if any.

4. Nothing in this Order shall be construed to limit or otherwise affect EPA's right of access and entry pursuant to any other applicable laws and regulations, including Section 3007 of the Act and the Comprehensive Environmental Response Compensation and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. § 9601 et seq.

5. Nothing in this section shall be construed to limit or otherwise affect the Respondent's liability and obligation to perform corrective action, including corrective action beyond the facility boundary, notwithstanding the lack of access. EPA may determine that additional on-site measures must be taken to address releases beyond the facility boundary if access to off-site areas cannot be obtained.

XIII. Emergency Provisions

1. In the event the Respondent identifies a current or imminent threat to human health or the environment, the Respondent shall notify EPA orally as soon as practicable and notify EPA in writing within ten (10) days, summarizing the nature, immediacy, and magnitude of the actual or potential threats to human health or the environment. The Respondent shall, as soon as possible, submit to EPA for its approval, a plan to mitigate such threat. EPA will approve or modify this plan, and the Respondent shall implement this plan as approved or modified by EPA. If EPA determines that quicker action is required, then the Director of the Air and Waste Management Division, Region II, may orally authorize Respondent to act prior to Respondent's making any written submission to EPA. In the case of an extreme emergency, Respondent may act without prior EPA approval; any such unapproved action shall be taken at Respondent's own risk, and Respondent shall be responsible for any different or additional action subsequently required by EPA to mitigate the threat(s) or the consequences of the unapproved action.

2. If EPA identifies a current or imminent threat to human health and environment, or determines that activities in compliance or non-compliance with this Order, have caused or may cause a release of a hazardous waste or hazardous constituents, or may pose a threat to human health or the environment, EPA may direct Respondent to stop further implementation of this Order, or a portion of this Order, for such period of time as may be needed to abate any such release or threat and/or require Respondent to undertake any action or perform any work EPA determines to be necessary.

3. Work required under the Emergency Provision of the Order shall be limited to interim measures and stabilization.

XIV. Availability of Information/Notification

1. Respondent shall give the EPA Project Coordinator twenty (20) days advance oral notice of the following activities undertaken pursuant to this Order: all well monitoring activities, including, but not limited to, drilling, installation and testing; and all on-site and off-site field activities, such as installation or removal of equipment, or sampling events, geophysical studies, or soil gas monitoring. At the request of EPA, Respondent shall provide or allow EPA or its authorized representatives to take split samples of any or all samples collected by the Respondent pursuant to this Order.

2. All data, information, and records created for or maintained by the Respondent pursuant to this Order shall be made available to EPA upon request. Respondent shall use its best efforts to insure that all employees of the Respondent and all persons, including contractors and subcontractors who engage in activities under this Order, are made available to, and cooperate with, EPA if information, whether written or oral, is sought.

3. All information, data, or records submitted to EPA by the Respondent shall be made available to the public including plans submitted by the Respondent pursuant to Attachments II and III. Respondent may assert a business confidentiality claim covering all or part of any information submitted to EPA. Any assertion of confidentiality shall be accompanied by sufficient documentation to justify the requirements of 40 C.F.R. § 2.204(e)(4). Information determined to be confidential by EPA shall be disclosed only to the extent permitted by 40 C.F.R. Part 2.

4. Respondent agrees not to assert any confidentiality claim with regard to any analytical data developed pursuant to this Order.

XV. Record Preservation

1. Respondent shall preserve or make arrangements for the preservation of, during the pendency of this Order and for a minimum of six (6) years after its termination, as specified in Section XXI of this Order, all data, records and documents in its possession or in the possession of its division, officers, directors, employees, agents, consultants, contractors (including subcontractors and independent contractors) which relate in any way to this Order, to its implementation or to the past and/or current hazardous waste management practices at the facility. The Respondent shall make such records available to EPA and/or shall provide copies of any documents that EPA requests. Written

notification shall be provided to EPA, ninety (90) days prior to the destruction of any or all such documents. Such written notification shall reference the date, caption, and docket number of this Order and shall be addressed to the Regional Administrator of U.S. EPA Region II with copies sent to the individuals listed in Section IX.2. of this Order.

2. All documents pertaining to this Order shall be stored in a centralized location to afford ease of access.

XVI. Reservation of Rights

1. EPA expressly reserves, without limitation, all of its statutory and regulatory powers, authorities, rights, remedies and defenses, both legal and equitable, including the right to seek injunctive relief, cost recovery, monetary penalties, and/or punitive damages.

2. This Order shall not be construed as a covenant not to sue, or as a release, waiver or limitation of any rights, remedies, defenses, powers and or authorities which EPA has under RCRA, CERCLA, or any other statutory, regulatory or common law authority of the United States.

3. This Order shall not limit or otherwise preclude EPA from taking any additional legal action against the Respondent should EPA determine that any such additional legal action is necessary or warranted.

4. This Order shall not relieve the Respondent of its obligation to obtain and comply with any federal, Commonwealth, county or local permit, nor is this Order intended to be, nor shall it be construed to be, a ruling or determination on, or of, any issue related to any federal, Commonwealth, county, or local permit.

5. EPA reserves the right to perform any portion of the work required by this Order including, but not limited to, any additional site characterization, feasibility study, interim measure, and/or response or corrective action deemed necessary to protect human health or the environment. EPA may exercise its authorities under Section 7003 of RCRA and/or Section 106 of CERCLA, or any other applicable authority to order or undertake removal and/or remedial actions at any time.

6. Notwithstanding compliance with the terms of this Order, Respondent is not released from liability for the costs of any response actions taken by EPA. EPA reserves the right to seek reimbursement from Respondent for any costs incurred by the United States.

7. If Respondent fails to comply with any terms or any provisions of this Order, EPA reserves the right to commence a subsequent action to require compliance, including the payment of stipulated penalties and/or to take any other action authorized by law.

XVII. Non-Release of Other Claims and Parties

Nothing in this Order shall constitute, or be construed to constitute, a release from any claim, cause of action or demand in law or equity against any person, firm, partnership, or corporation for any liability it may have arising out of, or relating in any way to, the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous constituent, hazardous substance, hazardous waste, pollutant, or contaminant found at, taken to, taken from, or emanating from the Facility.

XVIII. Public Participation

1. Following each of the following events: final written approval of the final RCRA Facility Investigation Report and the Corrective Measures Study Report (if necessary), EPA shall make these documents and any EPA summaries of these, available for public review and comment, as appropriate.

XIX. Indemnification of the United States Government

Respondent shall indemnify, save and hold harmless the United States Government, its agencies, departments, agents, and/or employees, from any and all claims or causes of action arising from or on account of acts or omissions of Respondent or its agents, independent contractors, receivers, trustees, subcontractors or successors and/or assigns in carrying out activities required by this Order. This indemnification shall not be construed as in any way affecting or limiting the rights or obligations of the Respondent or the United States under their various contracts or statutes.

XX. Other Applicable Laws

Respondent shall undertake all actions required by this Order in accordance with the requirements of all applicable local, Commonwealth and federal laws and regulations. Respondent shall obtain all permits and approvals necessary to perform the work required by this Order.

XXI. Termination and Satisfaction

The provisions of this Order shall be deemed satisfied and the obligations of the Respondent under this Order shall terminate upon Respondent's receipt of a written statement from EPA that Respondent has completed, to EPA's satisfaction, all the terms and conditions of this Order, including any additional work which EPA has determined to be necessary pursuant to this Order. So long as the Respondent is performing work pursuant to, or required by this Order, this Order shall not be deemed terminated or satisfied. At any time after Respondent completes all of the tasks required by this Order, including additional work requirements, Respondent may request in writing that EPA provide Respondent with this statement of completion. After reviewing Respondent's request, EPA will provide Respondent with this statement of completion, or a written statement as to the basis for a refusal to provide Respondent with such statement of completion.

XXII. Survivability/Permit Integration

After the effective date of this Order, a RCRA/HSWA post-closure permit may be issued to the Facility incorporating the requirements of this Order by reference into the permit. Any requirements of this Order shall not terminate upon the issuance of a permit unless the requirement(s) are expressly replaced by equivalent or more stringent requirements in the permit and EPA approves such termination. If EPA approves the termination of specific requirements of this Order upon the issuance of a permit, this Order must be accordingly modified pursuant to Section XXIII below.

XXIII. Modification

1. This Order may be jointly amended by Respondent and EPA. Such amendments shall be in writing, shall first be signed by an authorized representative of the Respondent, and shall have as their effective date the date on which they are signed by the Director of the Air and Waste Management Division, Region II, U.S. EPA.

2. Notwithstanding the above, the EPA Branch Chief of the Air and Waste Management Division, Hazardous Waste Facilities Branch, Region II and the Respondent may agree to changes in the scheduling of events. Any such changes must be requested in writing by the Respondent and be approved in writing by the EPA Branch Chief of the Air and Waste Management Division, Hazardous Waste Facilities Branch, Region II.

3. No informal advice, guidance, suggestions, or comments by EPA regarding reports, plans, specifications, schedules, and any other writing submitted by the Respondent will be construed as an amendment or modification to this Order.

XXIV. No Final Agency Action

1. Notwithstanding any other provision of this Order, no action or decision by EPA pursuant to this Order, including without limitation, decisions of the Director of the Air and Waste Management Division for Region II, or any authorized representative of EPA, shall constitute final agency action giving rise to any rights of judicial review prior to EPA's initiation of a judicial action for a violation of this Order, which may include an action for penalties or an action to compel Respondent's compliance with the terms and conditions of this Order.

2. In any action brought by EPA for a violation of this Order, Respondent shall bear the burden of proving that EPA's action was arbitrary and capricious and not in accordance with the law, or this Order.

XXV. Severability

If any provision or authority of this Order or the application of this Order to any party or circumstance is found to be invalid or is temporarily stayed by the Director of the Air & Waste Management Division or by the terms of this Order, the remainder of this Order shall remain in force and shall not be affected thereby.

XXVI. Stipulated Penalties

1. Unless this Order has been modified pursuant to Section XXIII or unless the Respondent is excused under the "Force Majeure and Excusable Delay" provision of Section XXVII, or excused under the Dispute Resolution provision set forth in Section XXVIII, if the Respondent fails to comply with any requirement, term, or condition set forth in or required by this Order, it shall pay a Stipulated Penalty for each non-complying act as follows:

Deliverable	Stipulated Penalty For Each Day of Non-Compliance		
	1st through 10th day	11th through 30th day	31st day and beyond
Interim Measures	$1,500	$2,500	$3,500
RFI or CMS Workplan	$1,500	$2,500	$3,500
Quarterly Progress Reports	$500	$1,000	$2,500
Draft RFI or CMS Report	$2,000	$3,000	$5,000
Final RFI or CMS Report	$2,000	$3,000	$5,000
Notification of New Information Related to Potential Threats to Human Health or the Environment	$2,500	$5,000	$6,000
Submittal of Document Revisions	$500	$1,000	$1,500
Commence Work	$2,500	$5,000	$6,000

2. All penalties shall begin to accrue on the date that complete performance of a specific task is due or a violation occurs, and shall continue to accrue through the final day of non-compliance or complete correction of the non-compliance, whichever is later.

3. Interest shall also accrue on any amount owed at the rate established by the Secretary of the Treasury pursuant to 31 U.S.C. § 3717.

4. All penalties owed to EPA under this Section shall be due and payable within twenty days of Respondent's receipt from EPA of a written demand for payment of the penalties, subject to the Dispute Resolution provision (Section XXVIII) of this Order. Such written demand will describe the violations and will indicate the date upon which penalties began or begin to accrue as set forth in paragraph 2 of this Section. Stipulated penalties shall continue to be due through the final day of non-compliance or complete correction of the non-compliance, whichever is later, notwithstanding the date of EPA's demand letter. Stipulated penalties shall be paid by cashier's or certified check made payable to "Treasurer of the United States" and shall be mailed to Regional Hearing Clerk, U.S. Environmental Protection Agency, P.O. Box 360188M, Pittsburgh, Pennsylvania 15251, unless another entity or official is designated by EPA. The check shall reference the complete name and address of the Respondent, the name of this Order, and its docket number. A copy of the check and letter forwarding the check shall also be submitted to the EPA Project Coordinator.

5. The stipulated penalty set forth above shall not in any way alter or relieve the Respondent from any obligation or responsibility imposed by or under the terms of this Order. Moreover, nothing in this subparagraph or Section shall be construed as prohibiting, altering, or in any way limiting EPA's ability to seek or impose any other remedy, sanction, or penalty.

6. No payments made under this Section shall be claimed or used as a tax deduction by the Respondent.

7. In any action concerning the stipulated penalty provided for in this Section, the Respondent shall have the burden of proving that it was at all times strictly complying with the terms and conditions of this Order.

XXVII. Force Majeure and Excusable Delay

1. Respondent shall perform all the requirements of this Order within the time limits set forth, approved, or established herein, unless the performance is prevented or delayed solely by events which constitute a force majeure. A force majeure is defined as any event arising from causes not reasonably foreseeable and beyond the control of the Respondent which could not be overcome by due diligence and which delays or prevents performance by a date required by this Order. Such events do not include unanticipated or increased costs of performance, changed economic circumstances, normal precipitation events, or failure to obtain federal, state, or local permits (unless such permitting delays are due solely to the permitting authority).

2. The Respondent shall notify in writing the EPA Project Coordinator within five (5) days after it becomes aware of any event, which it knows or should know, constitutes a force majeure. Such notice shall detail the estimated length of delay, including necessary demobilization and remobilization, its causes, measures taken or to be taken to minimize the delay, and an estimated timetable for implementation of these measures. Respondent must adopt all reasonable measures to avoid and minimize the delay. Failure to comply with the notice provision of this section shall constitute a waiver of Respondent's right to assert a force majeure and shall be grounds for EPA to deny Respondent an extension of time for performance.

3. After receiving such notice from Respondent that Respondent is invoking the force majeure provisions of this Order, EPA shall respond in writing indicating either EPA's agreement that the event constitutes a force majeure or its disagreement and the reasons therefore.

4. If the Parties agree that a force majeure has occurred, the time for performance may be extended, upon EPA approval, for a period equal to the delay resulting from such circumstances. This shall be accomplished through written amendment to this Order pursuant to Section XXIII. Such an extension does not alter the schedule for performance or completion of any other tasks required by this Order unless these are also specifically altered by amendment of this Order.

5. In the event the Parties cannot agree that any delay or failure has been or will be caused by a force majeure, or if there is no agreement on the length of the extension, the dispute will be resolved in accordance with the Dispute Resolution provisions contained in Section XXVIII of this Order.

XXVIII. Dispute Resolution

1. Both parties shall use their best efforts to informally and in good faith resolve all disputes and differences of opinion. Notwithstanding the above, if Respondent disagrees, in whole or in part, with any disapproval or modification or other decision or directive made by EPA pursuant to this Order, Respondent shall notify EPA of its objections and the basis (bases) therefore within fifteen (15) calendar days of receipt of EPA's disapproval, modification, decision, or directive. Said notice shall set forth the specific points of the dispute, the position Respondent is maintaining, the basis (bases) for Respondent's position, and any matters Respondent considers necessary for EPA's determination. Upon EPA's receipt and consideration of such written notice, the Director of the Air and Waste Management Division, Region II, shall provide to Respondent his decision on the pending dispute, which decision shall be binding on both parties to this Order. EPA's decision shall not be arbitrary and capricious under EPA's existing laws, regulations and/or policies. CPC shall have the burden of proving EPA's determination was arbitrary and capricious.

2. The existence of a dispute as defined herein, and EPA's consideration of such matters as placed into dispute shall excuse, toll, or suspend during the pendency of the dispute resolution process the compliance obligation or deadline which is in dispute and any other obligation or deadline which is demonstrably dependent on the matters in dispute, and EPA shall not seek to assess a penalty for noncompliance with the obligation or deadline for the period of time during which the obligation or deadline was excused, tolled, or suspended, regardless of the decision on the dispute with the following two exceptions: (1) No obligation or deadline shall be excused, tolled, or suspended, unless the Director of the Air and Waste Management Division, Region II, determines that Respondent exercised due diligence to resolve the dispute; and (2) No obligation or deadline shall be excused, tolled, or suspended, unless the Director of the Air and Waste Management Division, Region II, determines that Respondent invoked the dispute resolution procedure in good faith.

XXIX. Effective Date

The effective date of this Order shall be ten days after the date on which the Director of the Air and Waste Management Division, U.S. EPA Region II, signs this Order.

XXX. Consent

Respondent consents to and agrees not to contest EPA's jurisdiction to issue this Order. In addition, whether brought in an administrative or judicial proceeding, the Respondent consents to and agrees not to contest EPA's jurisdiction to enforce or compel compliance with any term of this Order, including the collection of stipulated penalties.

Finding this Order to be accurate and reasonable, the Respondent consents to its issuance and its terms, and agrees to undertake all actions required by the terms and conditions of this Order, including any portions of the Order incorporated by reference. Respondent consents to the issuance of this Order, as an Order, pursuant to Section 3008(h) of RCRA, 42 U.S.C. § 6928(h), and explicitly waives its right to request a hearing on this matter. Finally, the Respondent agrees not to contest, and waives any defense concerning the validity of this Order, or any particular provision contained herein.

The signatory to this Order for Respondent certifies that he or she is fully authorized to enter into the terms and conditions of this Order.

Caribbean Petroleum Corporation
Respondent's Name

9-5-95
Date

Wilfredo Rodriguez
Signatory's Name (Print)

Signature

Managing Director
Signatory's Title (Print)

It is so Ordered:

Conrad Simon, Director
Air and Waste Management Division
U.S. Environmental Protection Agency
Region II
New York, New York 10278

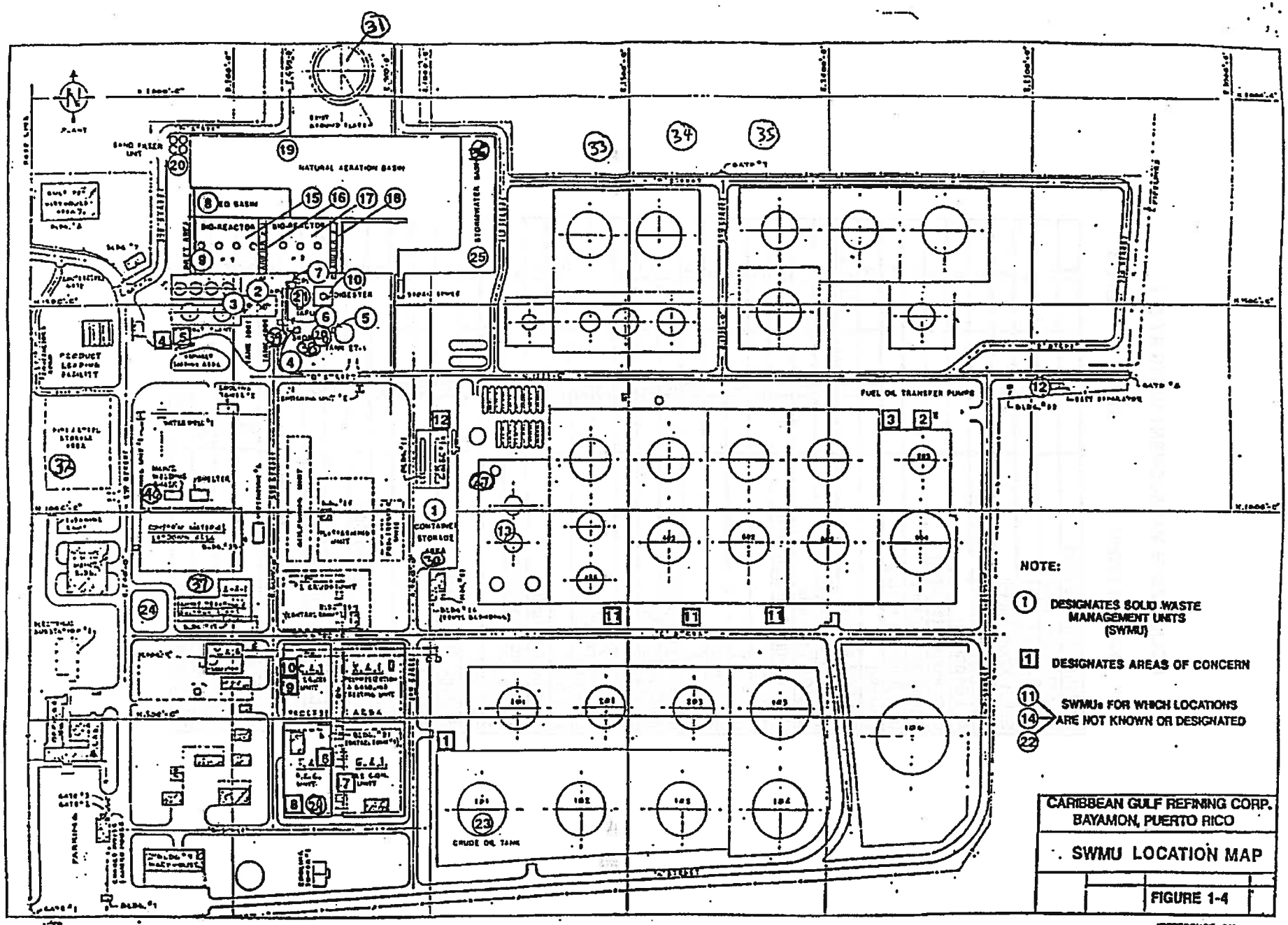
Date: 10/12/95

INDEX OF ATTACHMENTS

CPC 3008h

ATTACHMENT I

- Facility Diagram
- List of SWMUs and AOCs
- Summary of SWMUs and AOCs Release Determination


NATURAL AERATION BASIN
BIO-REACTOR
BIO-REACTOR
DIGESTER
STORMWATER BASIN
FUEL OIL TRANSFER PUMPS
CONTAINER STORAGE AREA
CRUDE OIL TANK
NOTE:
① DESIGNATES SOLID WASTE MANAGEMENT UNITS (SWMU)
1 DESIGNATES AREAS OF CONCERN
11, 14, 22 SWMUs FOR WHICH LOCATIONS ARE NOT KNOWN OR DESIGNATED
CARIBBEAN GULF REFINING CORP.
BAYAMON, PUERTO RICO
SWMU LOCATION MAP
FIGURE 1-4
(REFERENCE 33)

SOLID WASTE MANAGEMENT UNITS AT CPC

Name of SWMU	EPA #	CPC #
Container Storage Area	1	17
Slop Oil Tank 1000	2	--
Slop Oil Tank 1001	3	--
Solids Knockout Pit	4	2
Surge Tank ET-1	5	3
API Separator	6	4
Corr. Plate Interceptor	7	5
Equalization Basin	8	--
Inlet Basin Bioreactor 1	9	--
Digester	10	14
Old Oil Lagoons	11	22 & 23
Old East Separator	12	18
Slop Oil Tank 452	13	--
Old Tr. Plant Impoundment	14	--
Bioreactor 1	15	7
Clarifier 1	16	8
Bioreactor 2	17	9
Clarifier 2	18	10
Natural Aeration Basin	19	11
Sand Filter Unit	20	12
IAF Unit	21	6
Process Sewer	22	1
Crude Oil Tank 101	23	--
Sulfur Pit	24	19
Stormwater Basin	25	13
Sulfur Recycling Plant	26	--
Tank 481	27	--
Steel Bin	28	--
Storage Area - Particulate	29	--
Waste Pile	30	--
Flare	31	--
Old Landfill	32	24
Nonhazardous Disposal Site	33	25
Sulfur Lagoon	34	26
Catalytical Waste Pond	35	27
Lagoon	36	--
Sulfur Drum Storage Area	37	--
Centifuge	38	15
Gravity Thickener	39	16
Scrap Metal Yard	40	20
Old Loading Rack	AOC 12	21

EPA's SWMU and AOC List

SWMU 1 - Container Storage Area

SWMU 2 - Slop Oil Tank 1000

SWMU 3 - Slop Oil tank 1001

SWMU 4 - Solids Knockout Pit

SWMU 5 - Surge Tank ET-1

SWMU 6 - API Separator

SWMU 7 - Corrugated Plate Interceptor

SWMU 8 - Equalization Basin

SWMU 9 - Inlet Basin to Biological Rctr #1

SWMU 10 - Digester

SWMU 11 - Old Oil Lagoons

SWMU 12 - Old East Separator

SWMU 13 - Slop Oil Tank 452

SWMU 14 - Old Treatment Plant Imp. Area

SWMU 15 - Biolog. Rctr #1

SWMU 16 - Clarifier #1

SWMU 17 - Biolog. Rctr. #2

SWMU 18 - Clarifier #2

SWMU 19 - Natural Aeration Basin

SWMU 20 - Sand Filter Unit

SWMU 21 - Induced-Air Flotation Unit

SWMU 22 - Refinery Process Sewer

SWMU 23 - Crude Oil Tank 101

SWMU 24 - Sulfur Pit

SWMU 25 - Stormwater Basin

SWMU 26 - Sulfur Recycling Plant

SWMU 27 - Tank 481

SWMU 28 - Steel Bin

SWMU 29 - Storage Area for Particulate Matter

SWMU 30 - Waste Pile

SWMU 31 - Flare

SWMU 32 - Old Landfill

SWMU 33 - Nonhazardous Disposal Site

SWMU 34 - Sulfur Lagoon

SWMU 35 - Catalytic Waste Pond

SWMU 36 - Lagoon

SWMU 37 - Sulfur Drum Storage Area

SWMU 38 - Centrifuge

SWMU 39 - Gravity Thickener

SWMU 40 - Scrap Metal Yard

AOC 1 - Crude Unit Charge Pump

AOC 2 - Fuel oil Transfer Pump (Cummins) Area

AOC 3 - Fuel Oil Transfer Pump Area near Tank 603

AOC 4 - Asphalt Heater Unit

AOC 5 - Fuel Oil Loading Rack Pump Area

AOC 6 - Debutanizer Reboiler Area

AOC 7 - FCC Unit Compressor Lube System Area

AOC 8 - Heat Exchanger Bundles at Heavy Cycle Steam Generator

AOC 9 - Crude Unit #1 Area

AOC 10 - Crude Unit #1 near
Heat Exch. Bundle Area

AOC 11 - Fuel Oil Pipeline Spill Areas

AOC 12 - Old Gasoline Loading Rack Area

SWMUs and AOCs Determinations

The following determinations are based primarily on the RCRA Facility Assessment (dated March 1989) prepared by EPA. SWMUs 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, and 40 were identified subsequent to the March 1989 RFA.

SWMU 1 - Container Storage Area	RFI recommended. Base of unit has construction seams that are not sealed.
SWMU 2 - Slop Oil Tank 1000	RFI recommended. Pooled oil and staining on the ground around the base of the tank were noted.
SWMU 3 - Slop Oil tank 1001	RFI recommended. Pooled oil and staining on the ground around the base of the tank were noted.
SWMU 4 - Solids Knockout Pit	RFI recommended. Soil sampling for confirmation was done. See results.
SWMU 5 - Surge Tank ET-1	RFI recommended. Soil sampling for confirmation was done. See results.
SWMU 6 - API Separator	RFI recommended. This unit is part of wastewater system and should be investigated because GWM data indicates releases.
SWMU 7 - Corrugated Plate Interceptor	RFI recommended. This unit is part of wastewater system and should be investigated because GWM data indicates releases.
SWMU 8 - Equalization Basin	RFI recommended. This unit is part of wastewater system and should be investigated because GWM data indicates releases.
SWMU 9 - Inlet Basin to Biological Rctr #1 regulated unit	RFI recommended. This unit is part of Equalization Basin, above.
SWMU 10 - Digester	RFI recommended. This unit is part of wastewater system and should be investigated because GWM data indicates releases.
SWMU 11 - Old Oil Lagoons	Releases have not been determined. Additional information is needed.
SWMU 12 - Old East Separator	Releases have not been determined. Additional information is needed.

SWMU 13 - Slop Oil Tank 452	RFI recommended. Evidence of release was observed on the sides of the tanks.
SWMU 14 - Old Treatment Plant Imp. Area	Releases have not been determined. Location of this unit is within the Wasterwater Treatment Plant Area and will be addressed in the WWTP Area-wide Groundwater Monitoring Program.
SWMU 15 - Biolog. Rctr #1	RFI not recommended at this time.
SWMU 16 - Clarifier #1	RFI not recommended at this time.
SWMU 17 - Biolog. Rctr. #2	RFI not recommended at this time.
SWMU 18 - Clarifier #2	RFI not recommended at this time.
SWMU 19 - Natural Aeration Basin	RFI recommended. This unit is downstream from the Equalization Basin and should be investigated because this unit may be contributing to the releases indicated by the GWM data.
SWMU 20 - Sand Filter Unit	RFI not recommended at this time.
SWMU 21 - Induced-Air Flotation Unit	RFI not recommended at this time.
SWMU 22 - Refinery Process Sewer	RFI not recommended, but an assessment of the sewer system is recommended because it may be contributing to on-going releases.
SWMU 23 - Crude Oil Tank 101	RFI not recommended at this time.
SWMU 24 - Sulfur Pit	RFI not recommended at this time.
SWMU 25 - Stormwater Basin	RFI not recommended at this time.

SWMU 26 - Sulfur Recycling Plant	RFI not recommended at this time.
SWMU 27 - Tank 481	RFI not recommended at this time.
SWMU 28 - Steel Bin	RFI not recommended at this time.
SWMU 29 - Storage Area for Particulate Matter	RFI not recommended at this time.
SWMU 30 - Waste Pile	RFI not recommended at this time.
SWMU 31 - Flare	RFI not recommended at this time.
SWMU 32 - Old Landfill	Releases have not been determined. Additional information is needed.
SWMU 33 - Nonhazardous Disposal Site	Releases have not been determined. Additional information is needed.
SWMU 34 - Sulfur Lagoon	Releases have not been determined. Additional information is needed.
SWMU 35 - Catalytic Waste Pond	Releases have not been determined. Additional information is needed.
SWMU 36 - Lagoon	Releases have not been determined. Additional information is needed.
SWMU 37 - Sulfur Drum Storage Area	Releases have not been determined. Additional information is needed.
SWMU 38 - Centrifuge (reported by CPC as SWMU 15 and is part of wastewater treatment plant)	Releases have not been determined. Additional information is needed.
SWMU 39 - Gravity thickener (reported by CPC as SWMU 16 and is part of wastewater treatment plant)	Releases have not been determined. Additional information is needed.

SWMU 40 - Scrap metal yard (reported by CPC as SWMU 20)	Releases have not been determined. Additional information is needed.
AOC 1 - Crude Unit Charge Pump	RFI recommended. Evidence of release observed from this unit.
AOC 2 - Fuel oil Transfer Pump (Cummins) Area	RFI recommended. Soil sampling indicates presence of chrysene.
AOC 3 - Fuel Oil Transfer Pump Area near Tank 603	RFI recommended. Stain observed outside curbing.
AOC 4 - Asphalt Heater Unit	RFI recommended. Stain observed outside curbing.
AOC 5 - Fuel Oil Loading Rack Pump Area	RFI recommended. Stain observed on the soil.
AOC 6 - Debutanizer Reboiler Area	RFI recommended. Evidence of multiple past releases were observed.
AOC 7 - FCC Unit Compressor Lube System Area	RFI recommended. This area lacks containment and stains were evident.
AOC 8 - Heat Exchanger Bundles at Heavy Cycle Steam Generator	RFI recommended. Soil sampling indicates presence of chrysene.
AOC 9 - Crude Unit #1 Area	RFI recommended. Stain noted outside curb. Soil sampling indicates presence of chrysene.
AOC 10 - Crude Unit #1 near Heat Exch. Bundle Area	RFI recommended. Staining observed on foundation and soil. Soil sampling indicates presence of chrysene.
AOC 11 - Fuel Oil Pipeline Spill Areas	RFI recommended. Evidence of leaks near Tank 454, Tank 403, and tank 502 noted.
AOC 12 - Old Gasoline Loading Rack Area	RFI recommended. Known release of hydrocarbon in this area.

ATTACHMENT II

SCOPE OF WORK FOR A RCRA FACILITY INVESTIGATION (RFI)

RCRA FACILITY INVESTIGATION

Task I: Description of Current Conditions

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements

Task IV: Facility Investigation

Task V: Investigation Analysis

Task VI: Laboratory and Bench-Scale Studies

Task VII: Reports

SCOPE OF WORK FOR A RCRA FACILITY INVESTIGATION (RFI)

PURPOSE

The purpose of this RCRA Facility Investigation is to determine the nature and extent of releases of hazardous waste or hazardous constituents from regulated units, solid waste management units, and other source areas at the facility and to gather all necessary data to support the Corrective Measures Study, if one is determined to be necessary. The Respondent shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RCRA remedial investigation.

SCOPE

The RCRA Facility Investigation consists of seven tasks:

Task I: Description of Current Conditions
- A. Facility Background
- B. Nature and Extent of Contamination
- C. Implementation of Interim Measures

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements
- A. Project Management Plan
- B. Data Collection Quality Assurance Plan
- C. Data Management Plan
- D. Health and Safety Plan
- E. Community Relations Plan

Task IV: Facility Investigation
- A. Environmental Setting
- B. Source Characterization
- C. Contamination Characterization
- D. Potential Receptor Identification

Task V: Investigation Analysis
- A. Data Analysis
- B. Protection Standards

Task VI: Laboratory and Bench-Scale Studies

Task VII: Reports
- A. Preliminary and Workplan
- B. Progress
- C. Draft and Final

TASK I: DESCRIPTION OF CURRENT CONDITIONS

The Respondent shall submit for U.S. EPA approval, a report providing the background information pertinent to the facility, contamination, and interim measures as set forth below. The data gathered during any previous investigations or inspections and other relevant data shall be included.

A. Facility Background

The Respondent's report shall summarize the regional location, pertinent boundary features, general facility physiography, hydrogeology, and historical use of the facility for the treatment, storage or disposal of solid and hazardous waste. The Respondent's report shall include:

1. Map(s) depicting the following:

   a. General geographic location;

   b. Property lines, with the owners of all adjacent property clearly indicated;

   c. Topography and surface drainage (with a contour interval of two (2) feet and a scale of 1 inch = 100 feet) depicting all waterways, wetlands, floodplains, water features, drainage patterns, and surface water containment areas;

   d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;

   e. All solid or hazardous waste treatment, storage or disposal areas active after November 19, 1980;

   f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;

   g. All known past and present product and waste underground tanks or piping;

   h. Surrounding land uses (residential, commercial, agricultural, recreational); and

   i. The location of all production and ground water monitoring wells. These wells shall be clearly labeled and ground elevations and top of casing elevations and construction details included (these elevations and details may be included as an attachment).

All maps shall be consistent with the requirements set forth in 40 CFR § 270.14 and be of sufficient detail and accuracy to locate and report all current and future work performed at the site.

2. A history and description of ownership and operation, solid and hazardous waste generation, treatment, storage and disposal activities at the facility;

3. Approximate dates or periods of past product and waste spills, identification of the materials spilled, the amount spilled, the location where spilled, and a description of the response actions conducted (local, state, or federal response units or private parties), including any inspection reports or technical reports generated as a result of the response; and

4. A summary of past permits requested and/or received, any enforcement actions and their subsequent responses, and a list of documents and studies prepared for the facility.

B. <u>Nature and Extent of Contamination</u>

The Respondent shall prepare and submit for U.S. EPA approval, a preliminary report describing the existing information on the nature and extent of contamination.

1. The Respondent's report shall summarize all possible source areas of contamination. This, at a minimum, should include all regulated units, solid waste management units, spill areas, and other suspected source areas of contamination. For each area, the Respondent shall identify the following:

   a. Location of unit/area (which shall be depicted on a facility map);

   b. Quantities of solid and hazardous wastes;

   c. Hazardous waste or constituents, to the extent known; and

   d. Identification of areas where additional information is necessary.

2. The Respondent shall prepare an assessment and description of the existing degree and extent of contamination. This should include:

a. Available monitoring data and qualitative information on locations and levels of contamination at the facility;

b. All potential migration pathways including information on geology, petrology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and

c. The potential impact(s) on human health and the environment, including demography, ground water and surface water use, and land use.

C. Implementation of Interim Measures

The Respondent's report shall document interim measures which were or are being undertaken at the facility. This shall include:

1. Objectives of the interim measures: how the measure is mitigating a potential threat to human health and the environment and/or is consistent with and integrated into any long term solution at the facility;

2. Design, construction, operation, and maintenance requirements;

3. Schedules for design, construction and monitoring; and

4. Schedule for progress reports.

TASK II: PRE-INVESTIGATION EVALUATION OF CORRECTIVE MEASURE TECHNOLOGIES

Prior to starting the facility investigation, the Respondent shall submit to EPA a report that identifies the potential corrective measure technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination. This report shall also identify any field data that needs to be collected in the facility investigation to facilitate the evaluation and selection of the final corrective measure or measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

TASK III: RFI WORKPLAN REQUIREMENTS

The Respondent shall prepare a RCRA Facility Investigation (RFI) Workplan. This RFI Workplan shall include the development of several plans which shall be prepared concurrently. During the RCRA Facility Investigation, it may be necessary to revise the RFI Workplan to increase or decrease the detail of information collected to accommodate the facility specific situation. The RFI Workplan includes the following:

A. Project Management Plan

The Respondent shall prepare a Project Management Plan which will include a discussion of the technical approach, schedules, budget, and personnel. The Project Management Plan will also include a description of the qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall also document the overall management approach to the RCRA Facility Investigation.

B. Data Collection Quality Assurance Plan

The Respondent shall prepare a plan to document all monitoring procedures: sampling, field measurements, and sample analysis performed during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data and resulting decisions are technically sound, statistically valid, and properly documented.

1. Data Collection Strategy

The strategy section of the Data Collection Quality Assurance Plan shall include but not be limited to the following:

a. Description of the intended uses for the data, and the necessary level of precision and accuracy for these intended uses;

b. Description of methods and procedures to be used to assess the precision, accuracy, and completeness of the measurement data;

c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Examples of factors which shall be considered and discussed include:

i) Environmental conditions at the time of sampling;

ii) Number of sampling points;

iii) Representativeness of selected media; and

iv) Representativeness of selected analytical parameters.

d. Description of the measures to be taken to assure that the following data sets can be compared to each other:

i) RFI data generated by the Respondent over some time period;

ii) RFI data generated by an outside laboratory or consultant versus data generated by the Respondent;

iii) Data generated by separate consultants or laboratories; and

iv) Data generated by an outside consultant or laboratory over some time period.

e. Details relating to the schedule and information to be provided in quality assurance reports. The reports should include but not be limited to:

i) Periodic assessment of measurement data accuracy, precision, and completeness;

ii) Results of performance audits;

iii) Results of system audits;

iv) Significant quality assurance problems and recommended solutions; and

v) Resolutions of previously stated problems.

2. Sampling

The Sampling section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate sampling locations, depths, etc.;

b. Providing a statistically sufficient number of sampling sites;

c. Measuring all necessary ancillary data;

d. Determining conditions under which sampling should be conducted;

e. Determining which media are to be sampled (e.g., ground water, air, soil, sediment, etc.);

f. Determining which parameters are to be measured and where;

g. Selecting the frequency of sampling and length of sampling period;

h. Selecting the types of sample (e.g., composites vs. grabs) and number of samples to be collected;

i. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;

j. Documenting field sampling operations and procedures, including;

   i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g.,filters, and adsorbing reagents);

   ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;

   iii) Documentation of specific sample preservation method;

   iv) Calibration of field devices;

   v) Collection of replicate samples;

vi) Submission of field-biased blanks, where appropriate;

vii) Potential interferences present at the facility;

viii) Construction materials and techniques, associated with monitoring wells and piezometers;

ix) Field equipment listing and sample containers;

x) Sampling order; and

xi) Decontamination procedures.

k. Selecting appropriate sample containers;

l. Sample preservation; and

m. Chain-of-custody, including:

i) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment; and

ii) Pre-prepared sample labels containing all information necessary for effective sample tracking.

3. Field Measurements

The Field Measurements section of the Data Collection Quality Assurance Plan shall discuss:

a. Selecting appropriate field measurement locations, depths, etc.;

b. Providing a statistically sufficient number of field measurements;

c. Measuring all necessary ancillary data;

d. Determining conditions under which field measurements should be conducted;

e. Determining which media are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, etc.);

f. Determining which parameters are to be measured and where;

g. Selecting the frequency of field measurement and length of field measurements period; and

h. Documenting field measurement operations and procedures, including:

i) Procedures and forms for recording raw data and the exact location, time, and facility-specific considerations associated with the data acquisition;

ii) Calibration of field devices;

iii) Collection of replicate measurements;

iv) Submission of field-biased blanks, where appropriate;

v) Potential interferences present at the facility;

vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;

vii) Field equipment listing;

viii) Order in which field measurements were made; and

ix) Decontamination procedures.

4. Sample Analysis

The Sample Analysis section of the Data Collection Quality Assurance Plan shall specify the following:

a. Chain-of-custody procedures, including:

i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample custody records;

ii) Provision for a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and

iii) Specification of laboratory sample custody procedures for sample handling, storage, and dispersement for analysis.

b. Sample storage procedures and storage times;

c. Sample preparation methods;

d. Analytical procedures, including:

i) Scope and application of the procedure;

ii) Sample matrix;

iii) Potential interferences;

iv) Precision and accuracy of the methodology; and

v) Method detection limits.

e. Calibration procedures and frequency;

f. Data reduction, validation and reporting;

g. Internal quality control checks, laboratory performance and systems audits and frequency, including:

i) Method blank(s);

ii) Laboratory control sample(s);

iii) Calibration check sample(s);

iv) Replicate sample(s);

v) Matrix-spiked sample(s);

vi) "Blind" quality control sample(s);

vii) Control charts;

viii) Surrogate samples;

ix) Zero and span gases; and

x) Reagent quality control checks.

h. Preventive maintenance procedures and schedules;

i. Corrective action (for laboratory problems); and

j. Turnaround time.

C. Data Management Plan

The Respondent shall develop and initiate a Data Management Plan to document and track investigation data and results. This plan shall identify and set up data documentation materials and procedures, project file requirements, and project-related progress reporting procedures and documents. The plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

1. Data Record

The data record shall include the following:

a. Unique sample or field measurement code;

b. Sampling or field measurement location and sample or measurement type;

c. Sampling or field measurement raw data;

d. Laboratory analysis ID number;

e. Property or component measured; and

f. Result of analysis (e.g., concentration).

2. Tabular Displays

The following data shall be presented in tabular displays:

a. Unsorted (raw) data;

b. Results for each medium, or for each constituent monitored;

c. Data reduction for statistical analysis;

d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and

e. Summary data.

3. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

a. Display sampling location and sampling grid;

b. Indicate boundaries of sampling area, and areas where more data are required;

c. Display levels of contamination at each sampling location;

d. Display geographical extent of contamination;

e. Display contamination levels, averages, and maxima;

f. Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters; and

g. Indicate features affecting intramedia transport and show potential receptors.

D. Health and Safety Plan

The Respondent shall prepare a facility Health and Safety Plan.

1. Major elements of the Health and Safety Plan shall include:

a. Facility description, including availability of resources such as roads, water supply, electricity and telephone service;

b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted;

c. List key personnel and alternates responsible for site safety, response operations, and for protection of public health;

d. Delineate work areas;

e. Describe levels of protection to be worn by personnel in work areas;

f. Establish procedures to control site access;

g. Describe decontamination procedures for personnel and equipment;

h. Establish site emergency procedures;

i. Address emergency medical care for injuries and toxicological problems;

j. Describe requirements for an environmental surveillance program;

k. Specify any routine and special training required for responders; and

l. Establish procedures for protecting workers from weather-related problems.

2. The Facility Health and Safety Plan shall be consistent with:

a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b. EPA Order 1440.1 - Respiratory Protection;

c. EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

d. Facility Contingency Plan;

e. EPA Standard Operating Safety Guide (1984);

f. OSHA regulations particularly in 29 CFR §§ 1910 and 1926;

g. State, local, and other federal agency (e.g., DOD, DOE) regulations; and

h. Other EPA guidance as provided.

E. Community Relations Plan

The Respondent shall prepare a plan, for the dissemination of information to the public regarding investigation activities and results.

TASK IV: FACILITY INVESTIGATION

The Respondent shall conduct those investigations necessary to: characterize the facility (Environmental Setting); define the source (Source Characterization); define the degree and extent of contamination (Contamination Characterization); and identify actual or potential receptors (Potential Receptors).

The investigations should result in data of adequate technical quality to support the development and evaluation of the corrective measure alternative or alternatives during the Corrective Measures Study, if one is determined to be necessary.

The site investigation activities shall follow the plans set forth in Task III. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan. All sampling locations shall be documented in a log and identified on a detailed site map.

A. Environmental Setting

The Respondent shall collect information to supplement and verify existing information on the environmental setting at the facility. The Respondent shall characterize the following:

1. Hydrogeology

The Respondent shall conduct a program to evaluate hydrogeologic conditions at the facility. This program shall provide the following information:

a. A description of the regional and facility specific geologic and hydrogeologic characteristics affecting ground water flow beneath the facility, including:

i) Regional and facility specific stratigraphy: description of strata including strike and dip, identification of stratigraphic contacts;

ii) Structural geology: description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc.);

iii) Depositional history;

iv) Identification and characterization of areas and amounts of recharge and discharge;

v) Regional and facility specific ground water flow patterns; and

vi) Characterize seasonal variations in the ground water flow regime.

b. An analysis of any topographic features that might influence the ground water flow system. (Note: Stereographic analysis of aerial photographs may aid in this analysis.)

c. Based on field data, test, and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:

i) Hydraulic conductivity and porosity (total and effective);

ii) Lithology, grain size, sorting, degree of cementation;

iii) An interpretation of hydraulic interconnections between saturated zones; and

iv) The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content etc.).

d. Based on field studies and cores, structural geology, and hydrogeologic cross sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:

i) Sand and gravel deposits in unconsolidated deposits;

ii) Zones of fracturing or channeling in consolidated or unconsolidated deposits;

iii) Zones of higher permeability or lower permeability that might direct and restrict the flow of contaminants;

iv) The uppermost aquifer: geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs; and

v) Water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration including perched zones of saturation.

e. Based on data obtained from ground water monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring including:

i) Water-level contour and/or potentiometric maps;

ii) Hydrologic cross sections showing vertical gradients;

iii) The flow system, including the vertical and horizontal components of flow; and

iv) Any temporal changes in hydraulic gradients, for example, due to tidal or seasonal influences.

f. A description of manmade influences that may affect the hydrogeology of the site, identifying:

i) Active and inactive local water-supply and production wells with an approximate schedule of pumping; and

ii) Manmade hydraulic structures (pipelines, french drains, ditches, unlined ponds, septic tanks, NPDES outfalls, retention areas, etc.).

2. Soils

The Respondent shall conduct a program to characterize the soil and rock units above the water table in the vicinity of the contaminant release(s). Such characterization shall include but not be limited to, the following information:

a. SCS soil classification;

b. Surface soil distribution;

c. Soil profile, including ASTM classification of soils;

d. Transects of soil stratigraphy;

e. Hydraulic conductivity (saturated and unsaturated);

f. Relative permeability;

g. Bulk density;

h. Porosity;

i. Soil sorptive capacity;

j. Cation exchange capacity (CEC);

k. Soil organic content;

l. Soil pH;

m. Particle size distribution;

n. Depth of water table;

o. Moisture content;

p. Effect of stratification on unsaturated flow;

q. Infiltration

r. Evapotranspiration;

s. Storage capacity;

t. Vertical flow rate; and

u. Mineral content.

3. Surface Water and Sediment

The Respondent shall conduct a program to characterize the surface water bodies in the vicinity of the facility. Such characterization shall include, but not be limited to, the following activities and information:

a. Description of the temporal and permanent surface water bodies including:

i) For lakes and estuaries: location, elevation, surface area, inflow, outflow, depth, temperature stratification, and volume;

ii) For impoundments: location, elevation, surface area, depth, volume, freeboard, and purpose of impoundment;

iii) For streams, ditches, drains, swamps and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100 year event);

iv) Drainage patterns; and

v) Evapotranspiration.

b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH_3, NO_3^-/NO_2^-, PO_4^{-3}), chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc.

c. Description of sediment characteristics including:

i) Deposition area;

ii) Thickness profile; and

iii) Physical and chemical parameters (e.g., grain size, density, organic carbon content, ion exchange capacity, pH, etc.)

4. Air

The Respondent shall provide information characterizing the climate in the vicinity of the facility. Such information shall include, but not be limited to:

a. A description of the following parameters:

i) Annual and monthly rainfall averages;

ii) Monthly temperature averages and extremes;

iii) Wind speed and direction;

iv) Relative humidity/dew point;

v) Atmospheric pressure;

vi) Evaporation data;
vii) Development of inversions; and

viii) Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.

b. A description of topographic and manmade features which affect air flow and emission patterns, including:

i) Ridges, hills or mountain areas;

ii) Canyons or valleys;

iii) Surface water bodies (e.g., rivers, lakes, bays, etc.);

iv) Wind breaks and forests; and

v) Buildings.

B. Source Characterization

The Respondent shall collect analytical data to completely characterize the wastes and the areas where wastes have been placed, collected, or removed, including: type; quantity; physical form; disposition (containment or nature of deposits); and facility characteristics affecting release (e.g., facility security, and engineered barriers). This shall include quantification of the following specific characteristics at each source area:

1. Unit/Disposal Area characteristics:

a. Location of unit/disposal area;

b. Type of unit/disposal area;

c. Design features;

d. Operating practices (past and present);

e. Period of operation;

f. Age of unit/disposal area;

g. General physical conditions; and

h. Method used to close the unit/disposal area.

2. Waste Characteristics:

a. Type of waste placed in the unit;

i) Hazardous classification (e.g., flammable, reactive, corrosive, oxidizing, or reducing agent);

ii) Quantity; and

iii) Chemical composition.

b. Physical and chemical characteristics;

i) Physical form (solid, liquid, gas);

ii) Physical description (e.g., powder, oily sludge);

iii) Temperature;

iv) pH;

v) General chemical class (e.g., acid, base, solvent);

vi) Molecular weight;

vii) Density;

viii) Boiling point;

ix) Viscosity;

x) Solubility in water;

xi) Cohesiveness of the waste;

xii) Vapor pressure.

xiii) Flash point

c. Migration and dispersal characteristics of the waste;

i) Sorption;

ii) Biodegradability, bioconcentration, biotransformation;

iii) Photodegradation rates;

iv) Hydrolysis rates; and

v) Chemical transformations.

The Respondent shall document the procedures used in making the above determinations.

C. Contamination Characterization

The Respondent shall collect analytical data on ground water, soils, surface water, sediment, and subsurface gas contamination in the vicinity of the facility. This data shall be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of sampling, media sampled, concentrations found, conditions during sampling, and the identity of the individuals performing the sampling and analysis. The Respondent shall address the following types of contamination at the facility:

1. Ground Water Contamination

The Respondent shall conduct a Ground Water Investigation to characterize any plumes of contamination at the facility. This investigation shall, at a minimum, provide the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility;

b. The horizontal and vertical direction of contamination movement;

c. The velocity of contaminant movement;

d. The horizontal and vertical concentration profiles of Appendix IX constituents in the plume(s);

e. An evaluation of factors influencing the plume movement; and

f. An extrapolation of future contaminant movement.

The Respondent shall document the procedures used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

The Respondent shall conduct an investigation to characterize the contamination of the soil and rock units above the water table in the vicinity of the contaminant release. The investigation shall include the following information:

a. A description of the vertical and horizontal extent of contamination.

b. A description of contaminant and soil chemical properties within the contaminant source area and plume. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and other factors that might affect contaminant migration and transformation.

c. Specific contaminant concentrations.

d. The velocity and direction of contaminant movement.

e. An extrapolation of future contaminant movement.

The Respondent shall document the procedures used in making the above determinations.

3. Surface Water and Sediment Contamination

The Respondent shall conduct a surface water investigation to characterize contamination in surface water bodies resulting from contaminant releases at the facility. The investigation shall include, but not be limited to, the following information:

a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility, and the extent of contamination in underlying sediments;

b. The horizontal and vertical direction of contaminant movement;

c. The contaminant velocity;

d. An evaluation of the physical, biological and chemical factors influencing contaminant movement;

e. An extrapolation of future contaminant movement; and

f. A description of the chemistry of the contaminated surface waters and sediments. This includes determining the pH, total dissolved solids, specific contaminant concentrations, etc.;

The Respondent shall document the procedures used in making the above determinations.

4. Air Contamination

The Respondent shall conduct an investigation to characterize the particulate and gaseous contaminants released into the atmosphere. This investigation shall provide the following information:

a. A description of the horizontal and vertical direction and velocity of contaminant movement;

b. The rate and amount of the release; and

c. The chemical and physical composition of the contaminants(s) released, including horizontal and vertical concentration profiles. The Respondent shall document the procedures used in making the above determinations.

5. Subsurface Gas Contamination

The Respondent shall conduct an investigation to characterize subsurface gases emitted from buried hazardous waste and hazardous constituents in the ground water. This investigation shall include the following information:

a. A description of the horizontal and vertical extent of subsurface gas mitigation;

b. The chemical composition of the gases being emitted;

c. The rate, amount, and density of the gases being emitted; and

d. Horizontal and vertical concentration profiles of the subsurface gases emitted.

The Respondent shall document the procedures used in making the above determinations.

D. **Potential Receptors**

The Respondent shall collect data describing the human populations and environmental systems that are susceptible to contaminant exposure from the facility. Chemical analysis of biological samples may be needed. Data on observable effects in ecosystems may also be obtained. The following characteristics shall be identified:

1. Local uses and possible future uses of ground water:

   a. Type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/non-potable, and industrial); and

   b. Location of ground water users including wells and discharge areas.

2. Local uses and possible future uses of surface waters draining the facility:

   a. Domestic and municipal (e.g., potable and lawn/garden watering);

   b. Recreational (e.g., swimming, fishing);

   c. Agricultural;

   d. Industrial; and

   e. Environmental (e.g., fish and wildlife propagation).

3. Human use of or access to the facility and adjacent lands, including but not limited to:

   a. Recreation;

   b. Hunting;

   c. Residential;

   d. Commercial;

   e. Zoning; and

f. Relationship between population locations and prevailing wind direction.

4. A description of the biota in surface water bodies on, adjacent to, or affected by the facility.

5. A description of the ecology overlying and adjacent to the facility.

6. A demographic profile of the people who use or have access to the facility and adjacent land, including, but not limited to: age, sex, and sensitive subgroups.

7. A description of any endangered or threatened species near the facility.

TASK V: INVESTIGATION ANALYSIS

The Respondent shall prepare an analysis and summary of all facility investigations and their results. The objective of this task shall be to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support the Corrective Measures Study, if one is determined to be necessary.

A. Data Analysis

The Respondent shall analyze all facility investigation data outlined in Task IV and prepare a report on the type and extent of contamination at the facility including sources and migration pathways. The report shall describe the extent of contamination (qualitative/quantitative) in relation to background levels indicative for the area.

B. Protection Standards

1. Ground Water Protection Standards

For regulated units, the Respondent shall provide information to support the Agency's selection/ development of Ground Water Protection Standards for all of the Appendix IX constituents found in the ground water during the Facility Investigation (Task IV).

a. The Ground Water Protection Standards shall consist of:

i) for any constituents listed in Table 1 of 40 CFR § 264.94, the respective value given in that table (MCL) if the background level of the constituent is below the value given in Table 1; or

ii) the background level of that constituent in the ground water; or

iii) a U.S. EPA approved Alternate Concentration Limit (ACL).

b. Information to support the Agency's subsequent selection of Alternate Concentration Limits (ACLs) shall be developed by the Respondent in accordance with U.S. EPA guidance. For any proposed ACLs, the Respondent shall include a justification based upon the criteria set forth in 40 CFR § 264.94(b).

c. After receipt and review of any proposed ACLs, the U.S. EPA shall notify the Respondent in writing of approval, disapproval or modifications. The U.S. EPA shall specify, in writing, the reason(s) for any disapproval or modification.

d. Within sixty (60) days of receipt of the U.S. EPA's notification or disapproval of any proposed ACL, the Respondent shall withdraw the application or amend and submit revisions to the U.S. EPA.

2. For all other units or areas of contamination, the Respondent shall propose a ground water protection standard for each Appendix IX constituent found in the ground water and provide adequate information to support this proposal, including a justification based upon the criteria set forth in 40 CFR § 264.94(b)..

a. The proposed ground water protection standard will be reviewed by EPA in accordance with U.S. EPA guidance for ACLs.

b. After receipt and review of any proposed ground water protection standards, the U.S. EPA shall notify the Respondent in writing of approval, disapproval or modifications. The U.S. EPA shall specify in writing the reason(s) for any disapproval or modification.

c. Within sixty (60) days of receipt of the U.S. EPA's notification or disapproval of any proposed ACL, the Respondent shall withdraw the proposal or amend and submit revisions to the U.S. EPA.

3. Other Relevant Protection Standards

The Respondent shall identify all relevant and applicable standards for the protection of human health and the environment (e.g., National Ambient Air Quality Standards, Federally-approved State water quality standards, etc.).

C. Respondent may propose that no further action is required upon completion of the RFI and its conclusion that levels of contamination (i.e., hazardous constituents), which are representative of the SWMU or AOC, do not exceed the appropriate action levels proposed by CPC. Respondent shall provide supporting documentation and references for the specific action levels.

Respondent's proposal is subject to EPA review and approval.

TASK VI: LABORATORY AND BENCH-SCALE STUDIES

The Respondent shall conduct laboratory and/or bench scale studies to determine the applicability of a corrective measure technology or technologies to facility conditions. The Respondent shall analyze the technologies, based on literature review, vendor contracts, and past experience to determine the testing requirements.

The Respondent shall develop a testing plan identifying the types(s) and goal(s) of the study(ies), the level of effort needed, and the procedures to be used for data management and interpretation.

Upon completion of the testing, the Respondent shall evaluate the testing results to assess the technology or technologies with respect to the site-specific questions identified in the test plan.

The Respondent shall prepare a report summarizing the testing program and its results, both positive and negative.

TASK VII: REPORTS

A. Preliminary and Workplan

The Respondent shall submit to the EPA reports on Tasks I and II when it submits the RCRA Facility Investigation (RFI) Workplan (Task III).

B. Progress

The Respondent shall at a minimum provide the EPA with signed, quarterly progress reports containing:

1. A description and estimate of the percentage of the RFI completed;

2. Summaries of all findings;

3. Summaries of all changes made in the RFI during the reporting period;

4. Summaries of all contacts with representative of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during the reporting period;

8. Projected work for the next reporting date

C. Draft and Final

Upon completion by Respondent of Tasks IV and V, and receipt of EPA approval, the Respondent shall prepare a RFI Report and a RFI Summary Report to present the results of Tasks IV and V. The RFI Report and RFI Summary Report shall be developed in draft form for EPA review. The RFI Report shall be developed in final format incorporating EPA's comments, if any, on the Draft RCRA Facility Investigation Report. The results of Task VI, if deemed to be required, shall be submitted as a separate report in accordance with the approved schedule. The schedule for submitting Task VI results or justification that Task VI is not needed shall be submitted with the draft RFI Report.

A summary of the information reporting requirements contained in the RCRA Facility Investigation Scope of Work is presented below:

[NOTE: Due dates are calculated from the effective date of this Order, unless otherwise specified.]

Facility Submission	Due Date
Description of Current Situation (Summary of Task I)	Concurrent w/ RFI Workplan
Pre-Investigation Evaluation of Corrective Measure Technologies (Task II)	Concurrent w/ RFI Workplan
RFI Workplan	180 calendar days
Draft RFI Report (Tasks IV and V)	In accordance with approved schedule in RFI Workplan
Final RFI Report (Tasks IV and V)	Due date established in EPA comment letter on Draft RFI Report
Laboratory and Bench-Scale Studies (Results of Task VI)	
• Propose schedule for submittal of Task VI results or justification that Task VI is not needed	Concurrent with submittal of draft RFI Report
• If Task VI is needed: Task VI results	In accordance with approved schedule
Progress Reports on Tasks I through VI	14 calendar days after end of quarter, with first quarter being from January to end of March

ATTACHMENT III

SCOPE OF WORK FOR CORRECTIVE MEASURES STUDY

CORRECTIVE MEASURE STUDY

Task I: Identification and Development of the Corrective Measure Alternative or Alternatives

Task II: Evaluation of the Corrective Measure Alternative or Alternatives

Task III: Justification and Recommendation of the Corrective Measure or Measures

Task IV: Reports

SCOPE OF WORK FOR A CORRECTIVE MEASURE STUDY

PURPOSE

The purpose of this Corrective Measure Study (CMS) is to develop and evaluate the corrective action alternative or alternatives and to recommend the corrective measure or measures to be taken at the Boricua Wood Processing, Inc. Facility. The Respondent will furnish the personnel, materials, and services necessary to prepare the corrective measure study, except as otherwise specified.

SCOPE

The Corrective Measure Study consists of four tasks:

Task I: Identification and Development of the Corrective Measure Alternative or Alternatives
- A. Description of Current Situation
- B. Establishment of Corrective Action Objectives
- C. Screening of Corrective Measures Technologies
- D. Identification of the Corrective Measure Alternative or Alternatives

Task II: Evaluation of the Corrective Measure Alternative or Alternatives
- A. Technical/Environmental/Human Health/Institutional
- B. Cost Estimate

Task III: Justification and Recommendation of the Corrective Measure or Measures
- A. Technical
- B. Environmental
- C. Human Health

Task IV: Reports
- A. Progress
- B. Draft
- C. Final
- D. Schedule

TASK I: IDENTIFICATION AND DEVELOPMENT OF THE CORRECTIVE ACTION ALTERNATIVE OR ALTERNATIVES

Based on the results of the RCRA Facility Investigation and consideration of the identified Preliminary Corrective Measure Technologies (Task II), the Respondent shall identify, screen, and develop the alternative or alternatives for removal, containment, treatment, and/or other remediation of the contamination based on the objectives established for the corrective action.

A. Description of Current Situation

The Respondent shall submit an update to the information describing the current situation at the Facility and the known nature and extent of the contamination as documented by the RCRA Facility Investigation Report. The Respondent shall provide an update to information presented in Task I of the RFI to the Agency regarding previous response activities and any interim measures which have or are being implemented at the Facility. The Respondent shall also make a Facility-specific statement of the purpose for the response, based on the results of the RCRA Facility Investigation. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. Establishment of Corrective Action Objectives

After consultation with Respondent, EPA will establish site specific objectives for the corrective action. These objectives shall be based on public health and environmental criteria, information gathered during the RCRA Facility Investigation, EPA guidance, and the requirements of any applicable Federal statutes. At a minimum, all corrective actions concerning groundwater releases from regulated units must be consistent with, and as stringent as, those required under 40 CFR § 264.100.

C. Screening of Corrective Measure Technologies

The Respondent shall review the results of the RCRA Facility Investigation and reassess the technologies specified in Task II and identify additional technologies which are applicable at the Facility. The Respondent shall screen the preliminary corrective measure technologies identified in Task II of the RCRA Facility Investigation and any supplemental technologies to eliminate those that may prove infeasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve the corrective measure objective within a reasonable

time period. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site-specific conditions. The screening step may also eliminate technologies based on inherent technology limitations. Site, waste, and technology characteristics which are used to screen inapplicable technologies are described in more detail below:

1. Site Characteristics

   Site data should be reviewed to identify conditions that may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2. Waste Characteristics

   Identification of waste characteristics that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by these waste characteristics should be eliminated from consideration. Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site); and

3. Technology Limitations

   During the screening process, the level of technology development, performance record, and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

D. **Identification of the Corrective Measure Alternative or Alternatives**

The Respondent shall develop the Corrective measure alternative or alternatives based on the corrective action objectives and analysis of Preliminary Corrective Measure Technologies, as presented in Task II of the RCRA Facility investigation and as supplemented following the preparation of the RFI Report. The Respondent shall rely on engineering practice to determine which of the previously identified technologies appear most suitable for the site.

Technologies can be combined to form the overall corrective action alternative or alternatives. The alternative or alternatives developed should represent a workable number of option(s) that each appear to adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. The Respondent shall document the reasons for excluding technologies, identified in Task II, as supplemented in the development of the alternative or alternatives.

TASK II: EVALUATION OF THE CORRECTIVE MEASURE ALTERNATIVE OR ALTERNATIVES

The Respondent shall describe each corrective measure alternative that passes through the Initial Screening in Task VIII and evaluate each corrective measure alternative and its components. The evaluation shall be based on technical, environmental, human health, and institutional concerns. The Respondent shall also develop cost estimates of each corrective measure.

A. **Technical/Environmental/Human Health/Institutional**

The Respondent shall provide a description of each corrective measure alternative which includes, but is not limited to, the following: preliminary process flow sheets; preliminary sizing and type of construction for buildings and structures; and rough quantities of utilities required. The Respondent shall evaluate each alternative in the four following areas:

1. Technical

The Respondent shall evaluate each corrective measure alternative based on performance, reliability, implementability and safety.

a. The Respondent shall evaluate performance based on the effectiveness and useful life of the corrective measure:

i) Effectiveness shall be evaluated in terms of the ability to perform intended functions, such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure shall be determined either through design specifications or by performance evaluation. Any specific waste or site characteristics which could potentially impede effectiveness

shall be considered. The evaluation should also consider the effectiveness of combinations of technologies; and

ii) Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. Each corrective measure shall be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technologies, must be considered in estimating the useful life of the project.

b. The Respondent shall provide information on the reliability of each corrective measure including its operation and maintenance requirements and its demonstrated reliability:

i) Operation and maintenance requirements include the frequency and complexity of necessary operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered; and

ii) Demonstrated and expected reliability is a way of measuring the risk and effect of failure. The Respondent should evaluate whether the technologies have been used effectively under analogous conditions; whether the combination of technologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

c. The Respondent shall describe the implementability of each corrective measure including the relative ease of installation (constructability) and the time required to achieve a given level of response:

i) Constructability is determined by conditions both internal and external to the Facility conditions and include such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the Facility (i.e., remote location vs. a congested urban area). The Respondent shall evaluate what measures can be taken to facilitate construction under these conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable off-site treatment or disposal facilities; and

ii) Time has two components that shall be addressed: the time it takes to implement a corrective measure and the time it takes to actually see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.

d. The Respondent shall evaluate each corrective measure alternative with regard to safety. This evaluation shall include threats to the safety of nearby communities and environments as well as those to workers during implementation. Factors to consider are fire, explosion, and exposure to hazardous substances.

2. Environmental

The Respondent shall perform an Environmental Assessment for each alternative. The Environmental Assessment shall focus on the Facility conditions and pathways of contamination actually addressed by each alternative. The Environmental Assessment for each alternative will include, at a minimum, an evaluation of: the short and long term beneficial and adverse effects of the response alternative; any adverse effects on environmentally sensitive areas; and an analysis of measures to mitigate adverse effects.

3. Human Health

The Respondent shall assess each alternative in terms of the extent to which it mitigates short and long term potential exposure to any residual contamination and protects human health both during and after implementation the corrective measure. The assessment will describe the levels and characterizations of contaminants on-site, potential exposure routes, and potentially affected populations. Each alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or guidelines acceptable to EPA.

4. Institutional.

The Respondent shall assess relevant institutional needs for each alternative. Specifically, the effects of Federal, State and local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative.

B. <u>Cost Estimate</u>

The Respondent shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs.

   a. Direct capital costs include:

      i) Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measure.

      ii) Equipment costs: Costs of treatment, containment, disposal, and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;

iii) Land and site-development costs: Expenses associated with purchase of land and development of existing property; and

iv) Buildings and services costs: Costs of process and non-process buildings, utility connections, purchased services, and disposal costs.

b. Indirect capital costs include:

i) Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

ii) Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;

iii) Start-up and shakedown costs: Costs incurred during corrective measure start-up; and

iv) Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate Facility characterization.

2. Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. The Respondent shall consider the following operation and maintenance cost components:

a. Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;

b. Maintenance materials and labor costs: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;

c. Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;

d. Purchased services: Sampling costs, laboratory fees, and professional fees for which the need can be predicted;

e. Disposal and treatment costs: Costs of transporting, treating, and disposing of waste materials, such as treatment plant residues, generated during operations;

f. Administrative costs: Costs associated with administration of corrective measure operation and maintenance not included under other categories;

g. Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accidental insurance; real estate taxes on purchased land or rights-of-way; licensing fees for certain technologies; and permit renewal and reporting costs;

h. Maintenance reserve and contingency funds: Annual payments into escrow funds to cover (1) costs of anticipated replacement or rebuilding of equipment and (2) any large unanticipated operation and maintenance costs; and

i. Other costs: Items that do not fit any of the above categories.

C. Environmental

The corrective measure or measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be favored.

TASK IV: REPORTS

The Respondent shall prepare a Corrective Measure Study Report presenting the results of Task I through IV and recommending a corrective measure alternative.

A. Progress Reports

The Respondent shall, at a minimum, provide the U.S. EPA with signed, quarterly progress reports containing:

1. A description and estimate of the percentage of the CMS completed;

2. Summaries of all findings;

3. Summaries of all changes made in the CMS during the reporting period;

4. Summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;

5. Summaries of all problems or potential problems encountered during the reporting period;

6. Actions being taken to rectify problems;

7. Changes in personnel during reporting period;

8. Projected work for the next reporting period; and

9. Copies of daily reports, inspection reports, laboratory/monitoring data, etc.

B. Draft Corrective Measures Study Report

The Report shall at a minimum include:

1. A description of the Facility;

   a. Site topographic map & preliminary layouts.

2. A summary of the corrective measure or measures;

   a. Description of the corrective measure or measures and rationale for selection;

   b. Performance expectations;

c. Preliminary design criteria and rationale;

d. General operation and maintenance requirements; and

e. Long term monitoring requirements.

3. A summary of the RCRA Facility Investigation and impact on the selected corrective measure or measures;

a. Field studies (groundwater, surface water, soil, air); and

b. Laboratory studies (bench scale, pick scale).

4. Design and Implementation Precautions;

a. Special technical problems;

b. Additional engineering data required;

c. Permits and regulatory requirements;

d. Access, easements, right-of-way;

e. Health and safety requirements; and

f. Community relations activities.

5. Cost Estimates and Schedules;

a. Capital cost estimate;

b. Operation and maintenance cost estimate; and

c. Project schedule (design, construction, operation).

C. <u>Final Corrective Measures Study Report</u>

The Respondent shall finalize the Corrective Measure Study Report incorporating comments received from EPA on the Draft Corrective Measure Study Report.

D. **Schedule**

Facility Submission	Due Date
Draft CMS Workplan	60 calendar days after acceptance of RFI Final Report
Final CMS Workplan	30 calendar days after EPA comments on Draft Workplan
Draft CMS Report	60 calendar days from completion of CMS.
Final CMS Report	30 calendar days after Public and EPA comments on Draft CMS Report
Progress Reports on Tasks I, II, & III	14 calendar days after end of quarter with first quarter being from January to end of March.

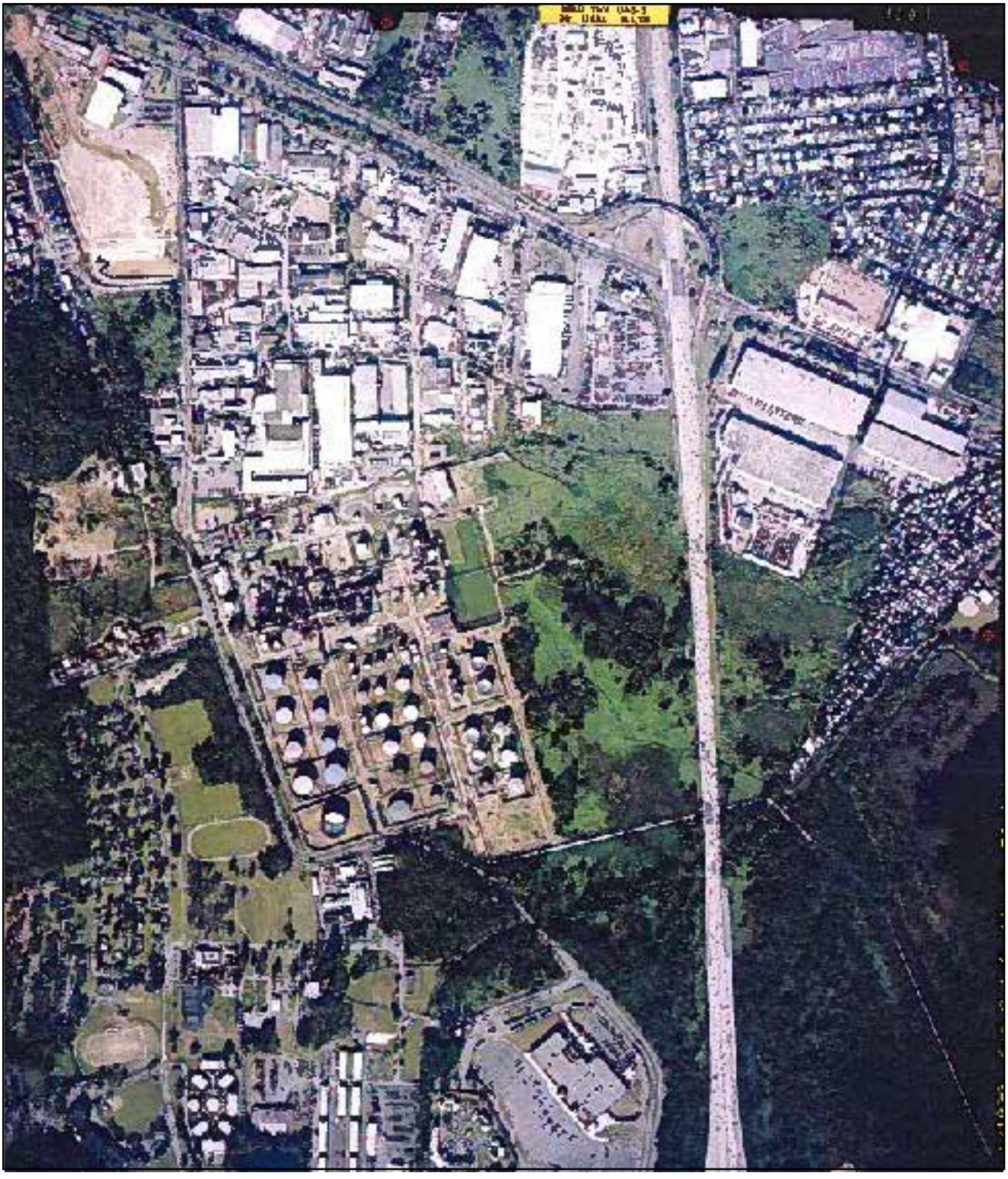
Appendix B

Aerial Photo Log

ARCADIS PUERTO RICO

Aerial Photo Log

Current Conditions
Report – Former CPR
Facility - Bayamón, PR



Facility in 2005

Facility During Fire (October 2009)

Facility After Fire (October 2009)

Wetland After Fire (October 2009)

Facility in July 2011

Facility in July 2011

Wetland in July 2011

Appendix C

USEPA's Environmental Indicator Assessments (2008)

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: Caribbean Petroleum Refining, LP (CPR)
Facility Address: Bayamón, Puerto Rico
Facility EPA ID#: PRD-00632182

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the Resource Conservation and Recovery Act (RCRA) Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determination status codes should remain in the RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The Caribbean Petroleum Refining, LP (CPR) facility is located in the Luchetti Industrial Park in Bayamón, Puerto Rico, approximately three miles south of the island's coast with the Atlantic Ocean. The CPR site encompasses approximately 179 acres, of which 115 are developed. The facility is divided into four general areas: tank farm area, process area, administration area, and wastewater treatment plant

area. In addition, CPR owns and operates a loading dock facility on San Juan Bay in Guaynabo, approximately two and one-half miles northeast of the main facility (Ref. 1).

Petroleum refining operations commenced at the site in 1955 under the name of Caribbean Refining Corporation. The facility was purchased in 1962 by the Gulf Oil Corporation, at which time the name was changed to Caribbean Gulf Refining Corporation. Chevron Corporation acquired ownership of the facility when it purchased Gulf Oil Corporation in 1984. In 1987, the facility was sold to First Oil Corporation and now operates as an independent refinery. Until cessation of operations in 2000, CPR operated a 48,000-barrel a day petroleum refining facility at the site. CPR now operates the facility as a petroleum product storage and distribution facility, although refining operations may commence again sometime in the future (Ref. 1).

The CPR site is bounded to the west and southwest by industrial and commercial facilities, and to the south and east by Fort Buchanan, a U.S. military reservation. Highway 28 separates the CPR facility from an industrial/commercial area to the southwest and from the Fort Buchanan property. An undeveloped land area owned by CPR is situated north of the operations area and extends about 1,000 feet (ft) north to Highway 22, a major thoroughfare in the Bayamón area. Swampy, undeveloped land, an industrial facility, and a small residential community occur north of Highway 22 (Ref. 2).

Hazardous wastes historically managed at the site include primary oil/water/solids separation sludge (F037), secondary oil/water/solids separation sludge (F038), slop oil emulsion solids (K049), heat exchanger bundle solids (K050), API separator sludge (K051), ignitable waste (D001), and toxicity characteristic (benzene) wastewater (D018) (Ref. 2).

CPR has two on-site water wells which are completed in the carbonate formations underlying the facility. However, only one of the wells (North well) is currently being used. Water from this well is used for process purposes only. Drinking water at the site is provided by a municipal supply system (Ref. 2).

Two general hydrogeologic units occur at the CPR facility. The uppermost unit is a clayey silt overburden, which contains a low permeability semi-perched layer and a permeable water-bearing zone (referred to as Zone A in CPR documents). Borehole information from the CPR facility shows that the overburden thickness varies from about 10 feet at the southern perimeter of the facility to about 90 feet at the northern perimeter (Ref. 3). The underlying second unit is an unlithified carbonate sediment. The water-bearing zone in the unlithified carbonate sediment is referred to as Zone B in CPR documents (Ref. 1).

During an April 2008 groundwater monitoring event, the general horizontal groundwater flow direction in Zone A was reported to be generally to the north, although localized mounds and depressions occurred in the central portion of the facility. Groundwater flow direction in Zone B ranged from north to northeast. An easterly flow component also was reported in the northern portion of the facility (Ref. 3).

Surface water bodies that traverse through the CPR facility are Las Lajas and Diego Creeks. Las Lajas Creek is a low-flow, shallow stream that originates in the hills south of the facility, traverses through the north-central part of the facility and eventually discharges into San Juan Bay, located about 1.75 miles north of the facility. Las Lajas Creek is channeled underground as it enters the facility and returns to an open channel north of the facility's wastewater treatment plant area (WWTP). Diego Creek is a shallow low-flow creek that traverses through the northwest portion of the CPR site (Ref. 1 and 2).

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   ___ If no - re-evaluate existing data, or

   ___ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs):

An Administrative Order on Consent was executed by EPA and CPR in October 1995 to investigate 32 solid waste management units (SWMUs)/Areas of Concern (AOCs), Las Lajas Creek Sediment, the facility Process Sewer, and the groundwater beneath the site. A RCRA Facility Investigation (RFI) is currently being performed at the facility, which includes a Sitewide Groundwater Monitoring Program (SGMP) (Ref. 2).

Interim measure activities consist of measurement and recovery of petroleum hydrocarbon light non-aqueous phase liquid (LNAPL) and groundwater monitoring. The CPR groundwater recovery monitoring system consists of 131 groundwater monitoring wells, 16 of which are sampled in March and 10 of which are sampled in September of every year to assess the downgradient migration of dissolved constituents from the LNAPL plumes. In addition, quarterly water level and/or product thickness measurements are also collected at the 131 monitoring wells. Monthly measurements are made at 63 of the wells (Ref. 4). LNAPL is routinely recovered at 60 wells. Twenty-two of the 60 recovery wells are equipped with pneumatic ejector pumps. Additional product is recovered from the remaining 38 wells by manual bailing. For the reporting period of October through December 2007, 873 gallons of product were recovered, and for the reporting period of January through March 2008, 265 gallons of product were recovered. As of March 2008, the total amount of product recovered since October 1991 was 80,368 gallons (Ref. 4 and 9).

RCRA closure of the Equalization Basin at the WWTP was completed in August 1999. Closure activities consisted of dewatering the basin, stabilization of the residual sludge, backfilling the basin, installing an impermeable clay and flexible membrane liner cap, installing a drainage layer, and installing a vegetative cap. Groundwater sampling is performed on an annual basis. Groundwater monitoring of this unit has been conducted since 1991, and was incorporated into the SGMP as part of corrective action in 2002. As per the sampling schedule in the SWGP, groundwater sampling at the former Equalization Basin was performed on a semi-annual basis during the three-year period of 2003 through 2005. Sampling is presently being performed every March, on an annual basis. Annual sampling began during 2006 and will continue through 2010. Sampling will be discontinued after 2010, if contaminant levels are less than EPA maximum contaminant levels (MCLs) in all wells and if there is no trend of increasing concentration (Ref.5).

In July 2006, an Interim Corrective Measures (ICM) Work Plan, Revision 2.0, was submitted to EPA. The ICM proposed soil excavation in the area of the former Old Oil Lagoons, so that a new tank for the CPR facility could be constructed in the area. An Addendum to the ICM Work Plan was submitted in March 2008. The tank has since been installed; however, EPA has not yet issued a no further action letter for the area under the tank. Additional information on the ICM was requested from the facility.

Concentrations of constituents of concern remain above levels which are protective of groundwater as indicated in Table 1 below (Ref. 7).

Results from soils sampling conducted at SWMU 11 in support of the ICM include the following contaminants which are above the soil screening levels (SSLs) for protection of groundwater for a dilution attenuation factor (DAF) of 20 (Ref. 7):

Table 1- ICM SWMU 11 Soil Data Above SSLs

Contaminant (SSL[1])	Detected Concentration	Sampling Location	Depth Range of Sample
Arsenic (29)	41.8 μg/L	PR – 1	10.5 – 11.0
	95.8 μg/L	PR – 4	5.0 – 5.5
	99.4 μg/L	PR – 7	9.5 – 10.0
	78.0 μg/L	PR – 7D	9.5 – 10.0
	79.8 μg/L	PR – 8	11.3 – 11.8
	115μg/L	PR – 8	15.5 – 16.0
	49.6 μg/L	PR – 14	10.0 – 10.5
Chromium (42[2])	188 μg/L	PR – 3	8.0 – 8.5
	1560 μg/L	PR – 3D	8.0 – 8.5
	1070 μg/L	PR – 3	12.6 – 13.1
	130 μg/L	PR – 4	5.0 – 5.5
	1080 μg/L	PR – 5	8.5 – 9.0
	161 μg/L	PR – 5	13.0 – 13.5
	139 μg/L	PR – 7	9.5 – 10.0
	117 μg/L	PR – 7D	9.5 – 10.0
	112 μg/L	PR – 8	11.3 – 11.8
	105 μg/L	PR – 13	6.2 – 6.8
	194 μg/L	PR – 14	10.0 – 10.5
2-Methylnaphthalene (18,000)	166,000 μg/L	PR – 14	10.0 –10.5
Benzo(a)anthracene (6,200[3])	18,100 μg/L	PR – 14	10.0 –10.5
Benzo(a)pyrene (6,200[3])	16,200 μg/L	PR – 14	10.0 –10.5
Benzo(b)flouranthene (6,200[3])	6,600 μg/L	PR – 14	10.0 –10.5

[1] SSL Values Taken From Ref. 8.

[2] Only those values which exceeded the site-specific background value for chromium of 86 μg/L were included in the Table.

[3] The benzo(a)pyrene MCL-based SSL was used in lieu of the risk-based SSL.

2. Is **groundwater** known or reasonably suspected to be "**contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

___ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Appropriately protective "levels" for the CPR facility include the federal MCLs and, where MCLs are not available, the Regional Screening Levels should be used (Ref. 8).

For lead, the EPA action level of 15 micrograms per liter (μg/l) was used as a groundwater screening level. For methyl tert butyl ether (MTBE), the acceptable drinking water guideline of 12 μg/l was used.

Groundwater sampling is conducted at select wells semi-annually for the underground recovery system (Ref. 4), and annually at select wells associated with the former Equalization Basin (Ref. 5).

Of the 131 groundwater monitoring wells in CPR's underground recovery monitoring system, 16 of these wells are used for the groundwater sampling program. The 16 wells selected are intended to provide information for evaluating potential downgradient migration of dissolved constituents from the FPH plume at the facility. Five of the sampled wells monitor the upper clayey sediment water-bearing zone (Zone A) and 11 monitor the unlithified carbonate sediment zone (Zone B) (Ref. 3).

The last comprehensive groundwater sampling events were conducted as part of the SGMP in May-July 2003 and October 2003. At that time, groundwater samples were collected from 51 monitoring wells and 11 direct-push locations (Ref. 1). Additional groundwater sampling at select wells has also been conducted between October 2003 and the present to address identified data gaps.

Petroleum hydrocarbons are present in upper clayey sediment and carbonate sediment water bearing zones at concentrations high enough to create LNAPLs. Water levels and product thicknesses are measured routinely in 131 monitoring wells throughout the facility as part of CPR's underground recovery monitoring system. Sixty of those wells are routinely pumped to remove free product (Ref. 9)

Sixteen monitoring wells have also been sampled for benzene, toluene, ethylbenzene, xylene, and dissolved lead since 1991. Dissolved lead was detected at wells MW-15A, MW-37A, MW-77B and MW-78B at concentrations ranging from 3.0 to 20.0 μg/L. The concentration at well MW-37A of 20.0 μg/L was the only detection above the lead screening level of 15 μg/L. Evaluation of historical results for dissolved lead shows the general absence of dissolved lead at the facility. The dissolved lead

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

detection above the action level at well MW-37A during the current sampling event was not expected and is inconsistent with historical results (Ref 3).

Six monitoring wells have been sampled for dissolved arsenic since March of 2004 (MW-20B, MW-21B, MW-75B, MW-76B2, MW-77B, and MW-78B). Dissolved arsenic was detected at well, MW-78B in April 2008 at a concentration of 4.0 μg/L, which is below the arsenic screening level of 10 μg/L (Ref 3).

Mercury has been detected at levels just about the MCL along the northern boundary of the site. Monitoring wells MW-21B and MW-78B have been sampled multiple times for mercury. Historic groundwater sampling for mercury at the CPR facility has been performed since March 1996. Mercury was detected at least once at 13 out of 52 monitoring wells. The four rounds of groundwater sampling for mercury (between June 2006 and December 2007) were performed at these wells, plus at one additional well (Well MW-17B) for delineation purposes. Dissolved mercury concentrations were below the screening level of 2 μg/L at all 14 sampled monitoring wells. Total mercury results were below the screening level at all monitoring wells, except MW-21B and MW-78B. Total mercury exceeded its screening level at well MW-21B (2.3 μg/L) only in July 2006 and at well MW-78B (2.2 μg/L) only in June 2007 where well construction and geologic characteristics make it difficult to obtain a sample without high turbidity (Ref 10).

In an April 2008 sampling event, dissolved mercury was detected at MW-78B (0.22 μg/L), below its screening level of 2 μg/L. The low level detection of mercury at this well is consistent with previous sampling events. Total and dissolved mercury were detected at MW-14A2 at 0.59 μg/L and 0.70 μg/L, respectively, which are below the mercury screening level. (Ref 3)

Mercury data well MW-21B shows an overall decreasing concentration trend for dissolved mercury. Dissolved mercury has been below its screening level since September 1999, with one exception (2.2 μg/L in May 2003). The total mercury results are highly variable and show a poor correlation to dissolved results. The TSS data for well MW-21B show low values, except for July 2006 (8 J mg/L), during which time the total mercury level (2.3 μg/L) exceeded the screening level, which is suggestive of high bias due to sample turbidity. Historical exceedances for total mercury also occurred in October and May 2003 (3.4 and 8.3 μg/L, respectively). Review of field notes from these two sampling rounds showed that the sample was slightly silty indicating sample turbidity.

In addition, during the April 2008 sampling event, samples were collected and analyzed for volatile organic compounds (VOCs) from well MW-30B. VOC detections at well MW-30B (located in the west-central part of the facility) consisted of 1,2-dichloropropane above its MCL of 5 ug/L (58.1 μg/L) and 1,2-dichloroethane below its MCL of 5 μg/L (3.8 μg/L). The detection of 1,2-dichloropropane is within the range of recent samples of 28.9 μg/L (March 2006) and 74.6 μg/L (June 2007) (Ref. 3).

VOCs were detected during the April 2008 sampling event. The VOC detections at well MW-14B (located in the central part of the facility, downgradient of the FPH plume) consisted of BTEX constituents with total BTEX concentrations of 3.95 μg/L. None of the individual BTEX concentrations exceeded MCLs. No other VOCs were detected at well MW-14B. (Ref. 3)

Trichloroethylene and vinyl chloride have been detected in monitoring wells along the eastern boundary of CPR. This plume is considered part of a larger plume located primarily on the property of Fort Buchanan, located east of CPR. Fort Buchanan is currently in the process of identifying the source and evaluating the need for remedial actions for this plume.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

   X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

   ___ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

   ___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Petroleum hydrocarbons are present in upper clayey sediment and carbonate sediment water bearing zones at concentrations high enough to create LNAPLs. Water levels and product thicknesses are measured routinely in 131 monitoring wells throughout the facility. Sixty of those wells are routinely pumped to remove free product. Twenty-two of the 60 recovery wells are equipped with pneumatic ejector pumps. Additional product is recovered from 38 supplemental wells by bailing; product is recovered weekly from 28 of the wells and monthly from 10 of the wells. Maps of the free product locations and thicknesses indicate all LNAPLs are within site boundaries (Ref. 3 and 9)

The BTEX source associated with MW-14B is interpreted to be from dissolution of the FPH plume with subsequent downgradient transport. The combined effects of dilution, dispersion, adsorption, volatilization, and biodegradation appear to reduce the concentration of any dissolved hydrocarbons downgradient of the plume and prevent off-site migration. Wells MW-15A and MW-16A are located nearest to the FPH plume upgradient of the CPR equalization basin. April 2008 and historical data for wells 15A and 16A show BTEX compounds have not been detected for more than ten years. Thus, the plume is unlikely to have an impact on groundwater monitoring results for the equalization basin (Ref. 3).

Sampling was performed at well MW-30B for VOCs in June 2007 in response to EPA's June 2006 email since 1,2-dichloropropane was detected above its MCL. This constituent was not detected in any downgradient wells and its potential presence at well MW-30B appears to be localized (Ref. 3).

VOC detections at well MW-30B (located in the west-central part of the facility) consisted of 1,2-dichloropropane above its MCL of 5 ug/L (58.1 ug/L) and 1,2-dichloroethane below its MCL of 5 μg/L (3.8 μg/L). The detection of 1,2-dichloropropane is within the range of recent samples of 28.9 μg/L (March 2006) and 74.6 μg/L (June 2007).

[2] "Existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

___ If yes - continue after identifying potentially affected surface water bodies.

_X_ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Surface water bodies that traverse through the CPR facility are Las Lajas and Diego Creeks. Las Lajas Creek is a low-flow, shallow stream that originates in the hills south of the facility, traverses through the north-central part of the facility and eventually discharges into San Juan Bay, located about 1.75 miles north of the facility. Las Lajas Creek is channeled underground as it enters the facility and returns to an open channel north of the facility's WWTP area. Once Las Lajas Creek has passed through the facility proper, much of the flow is outfall discharge. Diego Creek is a shallow low-flow creek that traverses through the northwest portion of the CPR site (Ref. 1 and 2).

Groundwater discharge from the overburden water-bearing zone to Las Lajas Creek was indicated as part of the Las Lajas Creek Assessment. Thus, groundwater sampling results from shallow wells nearby and adjacent to the creek (Monitoring Wells MP-1, MP-5A, MP-9, MP-10, MW-86A, MW-110A, and MW-111A) are used to demonstrate surface water environmental indicators. None of the results from these wells show any constituents of concern above groundwater screening levels. Total arsenic and vanadium were detected above screening levels at Monitoring Well MW-110A during the July 2004 sampling event; however, the dissolved metals results were below screening levels. High turbidity occurred in the groundwater sample, which biased high the total metals results. Therefore, the dissolved arsenic and vanadium results are considered to be more representative than the total metals results for this sampling event. Resampling of Monitoring Well MW-111A in September of 2004 showed that both total and dissolved metals were below screening levels, which confirms the dissolved metals results from July 2004. Therefore, no impact to surface water due to groundwater is indicated (Ref. 1).

Further, no LNAPL plumes occur adjacent to Las Lajas Creek, hence to impact to surface water from the LNAPL plumes is indicated. As discussed above, the LNAPL plumes are stable and not migrating (Ref. 1).

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

___ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

___ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

___ If unknown - enter "IN" status code in #8.

Rationale:

Not Applicable

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable"** (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

___ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

___ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

___ If unknown - skip to 8 and enter "IN" status code.

Rationale:

Not Applicable

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring**/measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

   _X_ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

   ___ If no - enter "NO" status code in #8.

   ___ If unknown - enter "IN" status code in #8.

Rationale:

Groundwater sampling is conducted at select wells semi-annually for the underground recovery system (Ref. 4), and annually at select wells associated with the former Equalization Basin (Ref. 5). The last comprehensive groundwater sampling events were conducted as part of the SGMP in May-July 2003 and October 2003. At that time, groundwater samples were collected from 51 monitoring wells and 11 direct-push locations (Ref. 1). Additional groundwater sampling at select wells has also been conducted between October 2003 and the present to address identified data gaps.

Groundwater sampling for underground recovery system will continue on a semiannual basis. The next sampling event is scheduled for September 2008 (Ref. 3). Water level and product thickness measurements will continue on a monthly and quarterly basis (Ref. 9).

Annual sampling for the former Equalization Basin began during 2006 and will continue through 2010. Sampling will be discontinued after 2010, if contaminant levels are less than EPA MCLs in all wells and if there is no trend of increasing concentration (Ref. 5).

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_X_ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the CPR site, EPA ID# PRD-00632182, located at in Bayamón, Puerto Rico, under current and reasonably expected conditions. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when EPA becomes aware of significant changes at the facility.

___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

___ IN - More information is needed to make a determination.

Completed by: Jill Billus Date: 08/23/2008
Jill Billus
Staff Consultant
TechLaw, Inc.

Reviewed by: Cathy Dare Date: 09/23/2008
Cathy Dare
Senior Staff Consultant
TechLaw, Inc.

Also reviewed by: Socorro Martinez Date: 09/29/2008
Socorro Martinez, Project Manager
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Luis R. Negron Date: 9/29/08
Luis Negron, Project Manager
RCRA Programs Branch
EPA Region 2

Date: 9/29/2008
Ariel Iglesias-Portalatin, Branch Chief
Response & Remediation Branch/CEPD
EPA Region 2

Approved by: Date: 09/30/2008
Carl Axel Soderberg, Director
Caribbean Environmental Protection Division
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified below. Reference materials are available at U.S. EPA, Region 2.

References:

1) *Sitewide Groundwater Monitoring Program, Draft Final Report.* Prepared by Anderson, Mulholland, and Associates, Inc. (AMAI). Dated January 2004.

2) *Documentation of Environmental Indicator Determination, Environmental Indicator RCRIS code (CA725), Current Human Exposures Under Control.* Dated September 29, 2004.

3) *Groundwater Quality Sampling Results, Underground Recovery System, April 2008.* Prepared by AMAI. Dated May 2008.

4) *Quarterly Data Summary, Underground Recovery System, October – December 2007.* Prepared by AMAI. Dated February 2008.

5) *Equalization Basin 2008 Annual RCRA Groundwater Monitoring Report.* Prepared by AMAI. Dated June 2008.

6) *Letter from Axel P. Soderberg, Director, Caribbean Environmental Protection Division, to Julio Hernandez, Refinery Manager, CPR, RE: Interim Corrective Measure Work Plan: Old Oil Lagoons (Rev 2) ADDENDUM, March 2008.* Dated June 6, 2008.

7) *Scope of Proposed Supplemental Soil Excavation at Old Oil Lagoons, Caribbean Petroleum Refining LP, Bayamon, Puerto Rico.* Prepared by AMAU. Dated January 2008.

8) *Generic Regional Screening Levels for Contaminants of Potential Concern at Superfund Sites*. Developed by Oak Ridge National Laboratory under an Interagency Agreement with EPA. Dated September 12, 2008. website access: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables

9) *Quarterly Data Summary, Underground Recovery System, January – March 2008.* Prepared by AMAI. Dated May 2008.

10) *Technical Memorandum, Groundwater Sampling for Mercury and TCE, Evaluation of Results from Four Sampling Rounds between July 2006 and December 2007, Sitewide Groundwater Monitoring Program.* Dated June 2008.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
Interim Final 2/5/99
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)
Current Human Exposures Under Control

Facility Name: **Caribbean Petroleum Refining LP**
Facility Address: **Carr. #28, Km. 2, Urb. Industrial Luchetti, Bayamón, Puerto Rico**
Facility EPA ID #: **PRD00632182**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __X__ If yes - check here and continue with #2 below.
   _____ If no - re-evaluate existing data, or
   _____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Description:

The Caribbean Petroleum Refining LP (CPR) facility is located in the Luchetti Industrial Park in Bayamón, Puerto Rico. The CPR site encompasses approximately 179 acres, of which 115 is developed. The facility is divided into four general areas: tank farm area, process area, administration area, and wastewater treatment plant area. In addition, CPR owns and operates a loading dock facility on San Juan Bay in Guaynabo, approximately two and one-half miles northeast of the site.

Petroleum refinery operations commenced at the site in 1955 under the name of Caribbean Refining Corporation. The facility was purchased in 1962 by the Gulf Oil Corporation, at which time the name was changed to Caribbean Gulf Refining Corporation. Chevron Corporation acquired ownership of the facility when it purchased Gulf Oil Corporation in 1984. In 1987, the facility was sold to First Oil Corporation and now operates as an independent refinery. Until cessation of operations in 2000, CPR operated a 48,000 barrel per day petroleum refining facility at the site. CPR now operates the facility as a petroleum product storage and distribution facility, although refining operations may commence again sometime in the future.

The CPR site is bounded to the west and southwest by industrial and commercial facilities, and to the south and east by Fort Buchanan, a U.S. military reservation. Highway 28 separates the CPR facility from an industrial/commercial area to the southwest and from the Fort Buchanan property. An undeveloped land area owned by CPR is situated north of the operations area and extends about 1000 ft north to Highway 22, a major thoroughfare in the Bayamón area. Swampy undeveloped land, an industrial facility, and a small residential community occur north of Highway 22.

Hazardous wastes historically managed at the site include primary oil/water/solids separation sludge (F037), secondary oil/water/solids separation sludge (F038), slop oil emulsion solids (K049), heat exchanger bundle solids (K050), API separator sludge (K051), ignitable waste (D001), and toxicity characteristic (benzene) wastewater (D018).

CPR has two on-site water wells which are completed in the carbonate formations underlying the facility. However, only one of the wells (North Well) is currently being used. Water from the well is used for process purposes only. Drinking water at the site is provided by a municipal supply system.

The regional groundwater flow direction in the area varies between north and northeast (Ref. 1). The nearest off-site water production wells occur within a distance of 3000 to 4000 ft to the east, south, and west of the CPR facility. There are no known water supply wells downgradient (north to northeast) of the facility.

Surface water bodies that traverse through the CPR facility are Las Lajas and Diego Creeks. Las Lajas Creek is a low-flow, shallow stream that originates in the hills south of the facility, traverses through the north-central part of the facility, and eventually discharges into San Juan Bay. Las Lajas Creek is channeled underground as it enters the facility and returns to an open channel north of the refinery's wastewater treatment plant (WWTP) area. Treated effluent from the WWTP was previously discharged to Las Lajas Creek under a National Pollutant Discharge Elimination System (NPDES) permit through NPDES Outfall 001. As of November 2002, the effluent is discharged by pipeline to San Juan Bay via NPDES Outfall 001A. Diego Creek is a shallow low-flow creek that traverses through the northwest portion of the CPR site. The Bayamón River traverses in a general north-south direction about 1.4 miles west of the facility. San Juan Bay is located about 1.75 miles northeast of the facility; the Atlantic Ocean is about 3 miles north.

An Administrative Order on Consent was executed by EPA and CPR in October 1995 to investigate 32 Solid Management Units (SWMUs)/Areas of Concern (AOC), Las Lajas Creek sediment, the facility Process Sewer, and the groundwater beneath the facility. A RCRA Facility Investigation (RFI) is currently being performed at the facility. Included in the RFI is a Sitewide Groundwater Monitoring Program designed to evaluate the groundwater quality at the facility. A Process Sewer assessment and human health assessment of Las Lajas Creek sediment were also completed.

Interim measure activities consist of measurement and recovery of petroleum hydrocarbon light non-aqueous phase liquid (LNAPL) and groundwater monitoring. LNAPL measurements are performed at 129 monitoring wells situated throughout the facility. Weekly and monthly measurements are performed at selected wells; quarterly measurements are performed at all the wells. LNAPL is recovered by 22 automatic ejector pumps and by manual bailing on a weekly and/or monthly basis at 35 supplemental wells. On average, about 350 gal per month of LNAPL are recovered. Groundwater sampling (VOCs, arsenic, lead, and/or mercury) is performed at 10 selected wells on a semiannual basis and 6 additional wells on an annual basis. The wells are mostly situated downgradient of the LNAPL plumes and also at the northern facility border. Semiannual groundwater sampling (BTEX) is also performed at 6 wells at the former facility equalization basin.

RCRA closure of the equalization basin at the WWTP was completed in August 1999. Closure activities consisted of dewatering the basin, stabilizing the residual sludge, backfilling the basin, installing an impermeable clay and flexible membrane liner cap, installing a drainage layer, and installing a vegetative cover. Groundwater monitoring at the former equalization basin is being addressed as part of corrective action.

References:

1. United States Geological Survey, 2002, Geology and Hydrogeology of the Caribbean Islands Aquifer System of the Commonwealth of Puerto Rico and the U.S. Virgin Islands: USGS Professional Paper 1419.

2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "contaminated"1 above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale / Key Contaminants
Groundwater	X			VOCs, BNAs, metals, and LNAPL
Air (indoors) 2		X		See discussion below
Surface Soil (e.g., <2 ft)	X			Arsenic
Surface Water		X		See discussion below
Sediment	X			Arsenic
Subsurf. Soil (e.g., >2 ft)	X			Arsenic, vanadium, benzo(a)anthracene, benzo(a)pyrene
Air (outdoors)	X			Benzene

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

A RCRA Facility Investigation (RFI) is being performed at the facility according to an EPA-approved March 2001 RFI Work Plan (Ref. 1) and an April 2002 Sitewide Groundwater Monitoring Program (SGMP) Work Plan (Ref. 2). The majority of the RFI work has been completed and reported (Refs. 3-11). A Process Sewer Assessment (Ref. 8) and human health assessment of Las Lajas Creek sediment and bank soil (Ref. 9) were also completed. An initial document for the human health baseline risk assessment for the facility has also been completed (Ref 12).

Footnotes:

1 "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

2 Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Groundwater:

The CPR facility is located in the north coast groundwater province of Puerto Rico. Two general water-bearing units are present beneath the facility: an upper overburden unit and an underlying carbonate sediment unit. Well yields in the overburden are generally less than in the carbonate sediment, as observed during well development and groundwater sampling activities. Groundwater in the overburden varies from unconfined to semi-confined. Groundwater in the carbonate sediment varies from semi-confined to confined. The regional groundwater flow direction varies between the north and northeast (Ref. 13). At the facility area groundwater flow in the overburden and carbonate generally varies from the north to east (Ref. 10), although localized variations occur due to geologic controls at the site, permeability contrasts, and local recharge. Groundwater is not used at the site for drinking water purposes.

Groundwater samples were collected and analyzed for VOCs, BNAs, and/or metals at 51 monitoring wells and at 11 direct-push locations as part of the RFI SGMP. Two SGMP groundwater sampling events were performed at the monitoring wells: May-July 2003 and October 2003. The direct-push groundwater sampling was performed during July 2003. Supplemental groundwater sampling was also performed at 6 newly installed monitoring wells in July and September 2004. The groundwater results are presented in (Refs. 10 and 11).

Groundwater results were compared to groundwater screening levels. Screening levels were EPA Maximum Contaminant Levels (MCLs) and, where MCLs are not available, EPA Region III tap water risk-based concentrations (RBCs) (EPA Region III, April 2004). For lead, the EPA action level of 15 ug/L was used as a groundwater screening level. For MTBE, the acceptable drinking water guideline (20 to 40 ug/L) established by EPA (Ref. 14) was used. The constituents of concern that exceeded groundwater screening levels, their maximum concentrations, and the location of the maximums are shown in the table below.

Groundwater Contaminant	Screening Levels (ug/L)	Maximum Concentration (ug/L)	Location of Maximum
Overburden Water-Bearing Zone			
Benzene	5	2910	Well MW-91A
1,2 Dichloroethane	5	6.9 J	DP location PS-15G
Methyl Tertiary-Butyl Ether	20-40**	652	Well B-2
Methylene Chloride	5	6.0	Direct-push location 11-13G
Bis(2-Ethylhexyl)Phthalate	6	20.8	Direct-push location PS-29G
2-Methylnaphthalene	120*	6100 J	Direct-push location PS-28G
Naphthalene	6.5*	358 J	Direct-push location PS-16G
Arsenic	10	55.4	Direct-push location PS-28G
Barium	2000	3590	Direct-push location PS-28G
Beryllium	4	10.4	Direct-push location PS-28G
Chromium	100	1130	Direct-push location PS-28G
Lead	15	170	Direct-push location PS-28G
Vanadium	260*	2850	Direct-push location PS-28G
Carbonate Sediment Water-Bearing Zone			
Cis-1,2-Dichlorethene	70	71.7	Well MW-75B
Trichloroethene	5	154 J	Well MW-83B1
Vinyl Chloride	2	5.8	Well MW-75B
Arsenic	10	121	Well MW-110B (see note)
Chromium	100	248	Well MW-110B (see note)
Mercury	2	3.4	Well MW-21B
Vanadium	260*	408	Well MW-110B (see note)

Notes: * - indicates an EPA Region 3 tap water RBC. ** - indicates EPA drinking water guideline. All other screening levels are EPA MCLs, except for lead, which is the EPA action level. The 'J' data qualifier indicates an estimated concentration. Total metal results at well MW-110B were above screening levels; dissolved metal results were below screening levels, however. High turbidity encountered during sampling at well MW-110B appears to have significantly biased high the total metals results. The dissolved metal results, which are below screening levels, are therefore believed to be more representative than the total metals results shown in the table.

Petroleum hydrocarbon LNAPL is detected in main five plumes contained within the facility. The plume locations are generally within the Tank Farm and WWTP areas of the facility. As discussed in Item 1, interim measures consisting of LNAPL measurement and recovery within the plumes are being performed on an ongoing basis. Wells downgradient of the LNAPL plumes have been monitored for the presence of LNAPL since about 1991. All of the five plumes have remained stable with negligible migration. Thus, the LNAPL plumes are stable.

Soil Vapor/Indoor Air:

For on-site groundwater, the only areas where volatile compounds occur in the groundwater within 100 ft of occupied on-site buildings are at the control rooms at the facility WWTP area and Process Sewer area (Ref. 10). Direct-push results from locations PS-28G and PS-29G are the closest upgradient locations to the control room at the WWTP that exhibits elevated VOC levels. Detected constituents were compared to the State of Connecticut Groundwater Standards for Protection of Indoor Air under the Industrial/Commercial Scenario (CT I/C VC) to determine whether migration of VOCs to indoor air may be of concern. Based on this comparison, no VOCs exceeded the CT I/C VC.

A trichloroethene (TCE) plume at the northeast refinery area migrates through the facility and offsite. The source and extent of the TCE plume, which may be from offsite, is under investigation. The residential community of Puente Blanco is located about 1200 ft north of well MW-75B at which chlorinated hydrocarbons (TCE, 1,2-dichloroethene, and vinyl chloride) were detected. The groundwater flow in the area of this well is to the northeast, which indicates that the residential community is not directly downgradient of the plume, hence no impact is likely. Additionally, State of Connecticut Groundwater Standards for Protection of Indoor Air standards apply only to groundwater within 15 ft below ground surface (bgs) as deeper sources are not likely to affect indoor air quality. The depth to the top of the carbonate sediment in the area of well MW-75B is about 44 ft bgs. Since the chlorinated hydrocarbon plume occurs only in the deeper carbonate sediment, no impact to indoor air quality in surface structures is likely. (Note: the State of Connecticut proposes to increase the depth criteria for indoor air to 30 ft bgs. Since the depth to the top of the carbonate sediment is deeper than this, no impact is indicated). Additionally, no buildings at CPR are located in this area of the facility. Hence, no exposure to workers is indicated.

Surface Soil (< 2 ft):

Surface soil samples were collected at 25 SWMUs/AOCs/areas as part of RFI activities (Refs. 3-8). The samples were analyzed for VOCs, BNAs, and/or metals. No constituents were detected in the surface soil above Region 3 industrial ingestion RBCs, with the exception of arsenic. Arsenic exceeded its Region 3 industrial RBC (1.9 mg/kg) at 25 SWMUs/AOCs with levels ranging up to 93.2 mg/kg. Arsenic also exceeded its background level of 23 mg/kg at 15 SWMUs/AOCs. Table 1 (attached) shows the maximum detected arsenic concentrations that exceed its surface soil screening level at the SWMUs/AOCs/areas.

Surface Water:

No surface water sampling has been performed in Las Lajas Creek. Groundwater discharge from the overburden water-bearing zone to the Creek was indicated as part of the Las Lajas Creek Assessment (Ref. 9). Thus, groundwater sampling results from shallow wells nearby and adjacent to the Creek (wells MP-1, MP-5A, MP-9, MP-10, MW-86A, MW-110A, and MW-111A) are used to demonstrate surface water environmental indicators. None of the results from these wells show any constituents of concern above groundwater screening levels (Refs. 10 and 11). Total arsenic and vanadium were detected above screening levels at well MW-110A during the July 2004 sampling event; the dissolved metals results were below screening levels, however. High turbidity occurred in the groundwater sample, which biased high the total metal results. Therefore, the dissolved arsenic and vanadium results are considered to be more representative than the total results for this sampling event. Resampling of well MW-110A in September 2004 showed that both total and dissolved metals were below screening levels, which confirms the dissolved metals results from July 2004. Therefore, no impact to surface water is indicated.

No LNAPL plumes occur adjacent to Las Lajas Creek, hence no impact to surface water is indicated. As discussed above, the LNAPL plumes are stable and not migrating.

Sediment:

Sediment samples were collected at nine locations in Las Lajas Creek upstream and within the facility boundary. Additionally, bank soil samples were collected at three locations north of the facility WWTP. The samples were analyzed for VOCs, BNAs, PCBs, and/or metals. Arsenic (maximum concentration of 71.2 mg/kg) was detected in sediment above its EPA Region 3 industrial ingestion RBC of 1.9 mg/kg and above the arsenic background level of 23 mg/kg. No other constituents were detected above RBCs in the sediment or bank soil. (Ref. 9).

No LNAPL plumes occur adjacent to Las Lajas Creek, hence no impact to sediment is indicated. As discussed above, the LNAPL plumes are stable and not migrating.

Subsurface Soil (> 2 ft):

Subsurface soil samples were collected at 30 SWMUs/AOCs/areas as part of RFI activities (Refs. 3-8). The samples were analyzed for VOCs, BNAs, and/or metals. No constituents were detected in the surface soil above Region 3 industrial ingestion RBCs, with the exception of arsenic, vanadium, benzo(a)anthracene, and benzo(a)pyrene. Arsenic exceeded its Region 3 industrial RBC (1.9 mg/kg) at 27 SWMUs/AOCs/areas with levels ranging up to 138 mg/kg. Arsenic also exceeded its background level of 23 mg/kg at 18 SWMUs/AOCs/areas. Vanadium (1350 mg/kg) exceeded its RBC (1000 mg/kg) only at SWMU 34; the background level of vanadium is 250 mg/kg. Benzo(a)anthracene (9900 ug/kg) exceeded its RBC (3900 ug/kg) only at SWMU 11. Benzo(a)pyrene (up to 8200 ug/kg) exceeded its RBC (390 ug/kg) only at SWMUs 3 and 11. Table 2 (attached) shows the maximum detected concentrations that exceed subsurface soil screening levels at the SWMUs/AOCs/areas.

Air (outdoors):

No constituents were detected in the soil above outdoor air (volatilization to air and fugitive dust) EPA risk-based screening levels (Ref. 15) with the exception of benzene at SWMU 1. Benzene exceeds its inhalation screening level (1000 ug/kg) at only 1 out of 10 sampling locations at SWMU 1. The concentrations in the surface soil (1.5-2 ft) and subsurface soil (4-4.5 ft) are 1700 and 2400 ug/kg, respectively.

No assessment of the impacts to outdoor air from groundwater has been conducted at the site. However, migration of VOCs from groundwater into outdoor air is not expected to be of concern due to natural dispersion of contaminants once they reach the surface. Also, since assessment of VOCs to indoor air as discussed above does not indicate any impact, exposure to outdoor air is not expected due to its greater dispersion.

References:

1. Anderson, Mulholland & Associates, Inc. (AMAI), 2001. RCRA Facility Investigation Work Plan (Revision 2), Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

2. Anderson, Mulholland & Associates, Inc. (AMAI), 2002. Sitewide Groundwater Monitoring Program Work Plan, Caribbean Petroleum Refining LP, Bayamón, Puerto Rico. (Revised in accordance with EPA's comments dated July 1, 2002, an August 8, 2002 teleconference and minutes, and Addendum 1.)

3. Anderson, Mulholland & Associates, Inc. (AMAI), 2000. Technical Memorandum: RCRA Facility Investigation, Phase IA Soil Investigation Results. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

4. Anderson, Mulholland & Associates, Inc. (AMAI), 2000. Technical Memorandum: RCRA Facility Investigation, Phase II Wastewater Treatment Plant Soil Investigation Results, Revision 1.0. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

5. Anderson, Mulholland & Associates, Inc. (AMAI), 2000. Technical Memorandum: RCRA Facility Investigation, Phase I Wastewater Treatment Plant Soil Investigation Results, Revision 1.0. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

6. Anderson, Mulholland & Associates, Inc. (AMAI), 2001. Technical Memorandum: RCRA Facility Investigation, Phase IB and 2A Soil Investigation Results. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

7. Anderson, Mulholland & Associates, Inc. (AMAI), 2002. Technical Memorandum: RCRA Facility Investigation, Phase 3 Soil Investigation Results. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

8. Anderson, Mulholland & Associates, Inc. (AMAI), 2003. Phase II Process Sewer Assessment Report, Revision 2. Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

9. Anderson, Mulholland & Associates, Inc. (AMAI), 2003. Las Lajas Creek Assessment, Supplemental Bank and Sediment Sampling Report (Revision 1). Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

10. Anderson, Mulholland & Associates, Inc. (AMAI), 2004. Sitewide Groundwater Monitoring Program, Draft Final Report, Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

11. September 20, 2004, Groundwater sampling results from six newly installed monitoring wells, Sitewide Groundwater Monitoring Program, submitted to EPA as preliminary data tables.

12. Anderson, Mulholland & Associates, Inc. (AMAI), 2004. Baseline Risk Assessment, Part 1, RAGS D Tables 0-2, Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

13. United States Geological Survey. 2002. Geology and Hydrogeology of the Caribbean Islands Aquifer System of the Commonwealth of Puerto Rico and the U.S. Virgin Islands. USGS Professional Paper 1419. Reston, Virginia.

14. U.S. Environmental Protection Agency (EPA), 1997. Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MTBE). Office of Water. EPA-833-F-97-009.

15. United States Environmental Protection Agency (EPA), 2001. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

3. Are there complete pathways between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **Human Receptors** (Under Current Conditions)

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food
Groundwater	NO	NO	NO	YES	--	--	NO
~~Air (indoors)~~	___	___	___	--	--	--	--
Soil (surface, e.g., <2 ft)	NO	YES	NO	YES	NO	NO	NO
~~Surface Water~~	___	___	--	--	___	___	___
Sediment	NO	YES	--	--	NO	NO	NO
Soil (subsurface e.g., >2 ft)				YES			NO
Air (outdoors)	NO	NO	NO	YES	NO		

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in 2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional pathway Evaluation Work Sheet to analyze major pathways).

_X_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

The CPR site is currently utilized for industrial purposes only, thus no residents or day-care receptors are exposed to on-site contamination. The carbonate sediment is the water-bearing zone most likely to be used for water resource development. None of the contaminants in the carbonate sediment water-bearing zone, other than the TCE plume at the northeast area of the facility, appear to occur off-site. The TCE source, which may be from off-site, and extent of the TCE plume is under investigation; CPR is making a diligent effort to gain off-site access to an upgradient facility. The arsenic plume in the carbonate sediment water-bearing zone does not appear to be migrating off-site since arsenic levels at downgradient border monitoring wells are below screening levels. Mercury (3.4 ug/L) is also present above its screening level (2 ug/L) at the northeast boundary of the CPR property. However, residents are not exposed to contaminated groundwater since there are no known downgradient water supply wells used for public or private drinking water supplies.

Arsenic was detected at overburden well MW-112A (28.1 ug/L total, 16.9 ug/L dissolved, screening level of 10 ug/L) at the SWMU 11 area (Old Oil Lagoons) (Ref. 1). Naphthalene was detected at overburden well MW-113A (9.3 ug/L, screening level of 6.5 ug/L). Wells MW-112A and MW-113A are located near the property boundary. The extent of the naphthalene plume appears to be limited since it is not detected at nearby well MW-112A. The arsenic plume also appears to be limited since arsenic is not detected at nearby wells MW-113A and MW-114A, which are located about 100 ft south and north, respectively (Ref. 1). Naphthalene at well MW-113A and arsenic at well MW-112A do not significantly exceed their screening levels, the plumes appear limited, and the overburden has low permeability. Consequently, the plumes appear to be stable, and migration appears to be under control. Additionally, no exposure to downgradient residents is indicated because there are no downgradient water supply wells; the low yield of the overburden additionally makes it unlikely for water resource development.

Access to the facility is limited to CPR employees and their contractors and visitors. The perimeter of the operations area of the facility is fenced and guarded 24 hours a day. Access is generally inaccessible to the undeveloped area of the facility north of the operations area due to a natural wetland barrier. Additionally, the Puerto Rico Highway Authority maintains a security fence adjacent to Highway 22, which borders the undeveloped area. Therefore, trespassers are not expected to gain access to the facility and are not expected to become exposed to impacted on-site soil. Additionally, trespassers exposure to sediment in Las Lajas Creek at the northeastern undeveloped area of the facility property is unlikely due to fencelines and natural barriers.

The remaining potential receptors are discussed below.

Workers via "contaminated":

Groundwater - no completed pathway occurs since there are no on-site wells for production or water supply or other opportunities for production workers to ingest contaminated groundwater. Drinking water for the facility is from a municipal supply.

Surface Soil - exposure to contaminated surface soil may occur to workers from concentrations of arsenic at 25 SWMUs/AOCs/areas that occur above screening levels. Arsenic levels occur up to 93.2 mg/kg. Table 1 (attached) shows the maximum detected arsenic concentrations that exceed its screening level at the SWMUs/AOCs/areas.

Sediment – exposure to contaminated sediment in Las Lajas Creek may occur to workers. Arsenic levels occur up to 71.2 mg/kg occur in the sediment (Ref. 2). Incidental exposure may also occur to off-site workers at the industrial facilities located to the southwest of CPR, through which Las Lajas Creek traverses. The off-site facilities are fenced in with access only to their workers. Additionally, the Creek area is located at the eastern extremities of these facilities that exhibits scant worker activity.

Outdoor Air - Benzene at SWMU 1 (Container Storage Area) exceeds its inhalation screening level (1000 ug/kg) at only 1 out of 10 sampling locations at SWMU 1. The concentrations in the surface soil (1.5-2 ft) and subsurface soil (4-4.5 ft) are 1700 and 2400 ug/kg, respectively. SWMU 1 is paved with concrete, which inhibits escape of vapors from the soil. Also, any minor escape of vapors through any cracks in the concrete is not likely to be of any significance due to natural dispersion of contaminants once they reach the surface. Therefore, no current worker exposure to outdoor air is indicated.

Construction Workers via "contaminated":

Groundwater - Construction workers may potentially come in direct contact with contaminated groundwater during intrusive activities.

Surface Soil - Exposure to surface soil may occur to construction workers from arsenic concentrations above screening levels at 25 SWMUs/AOCs/areas. Arsenic levels occur up to 93.2 mg/kg. Table 1 (attached) shows the maximum detected arsenic concentrations that exceed its screening level at the SWMUs/AOCs/areas.

Subsurface Soil - Exposure to subsurface soil may occur to construction workers from concentrations above screening levels of arsenic at 30 SWMUs/AOCs/areas, vanadium at SWMU 34, benzo(a)anthracene at SWMU 11, and benzo(a)pyrene at SWMUs 3 and 11. Table 2 (attached) shows the maximum detected concentrations that exceed screening levels at the SWMUs/AOCs/areas. Exposure to LNAPL in shallow plumes may also occur to construction workers.

Outdoor Air - Benzene at SWMU 1 exceeds its inhalation screening level (1000 ug/kg) at only 1 out of 10 sampling locations at SWMU 1. The concentrations in the surface soil (1.5-2 ft) and subsurface soil (4-4.5 ft) are 1700 and 2400 ug/kg, respectively.

References:

1. September 20, 2004, Groundwater sampling results from six newly installed monitoring wells, Sitewide Groundwater Monitoring Program, submitted to EPA as preliminary data tables.

2. Anderson, Mulholland & Associates, Inc. (AMAI), 2003. Las Lajas Creek Assessment, Supplemental Bank and Sediment Sampling Report (Revision 1). Caribbean Petroleum Refining LP, Bayamón, Puerto Rico.

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[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4. Can the exposures from any of the complete pathways identified in #3 be reasonably expected to be "significant"4 (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

   __X__ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to contamination" (identified in #3) are not expected to be "significant."

   _____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

   _____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

All individuals conducting intrusive activities conducted at CPR must first obtain a permit from the facility, which is reviewed by facility Health and Safety personnel. At SWMUs/AOCs/areas with contamination above relevant screening criteria, this process provides for protection of construction workers through adherence to applicable OSHA regulations (e.g., PPE use) or by not allowing intrusive activities or disturbances to occur. Therefore, construction worker exposure to surface soil, subsurface soil, or groundwater contamination is not currently expected to be significant.

The maximum total excess lifetime cancer risk to on-site workers from exposure to surface soil contaminated with arsenic is estimated to be 4.9×10^{-5}. This estimate is based on exposure to the maximum detected arsenic concentration of 93.2 mg/kg in the surface soil at the facility. (The risk estimate was obtained by proportioning the EPA Region 3 risk based level of 1.9 mg/kg, which is based on a risk of 1×10^{-6}.) The risk estimate is conservative as it is likely that worker exposure would not occur only at the area of maximum concentration. Actual worker exposure to arsenic in the surface soil would be less since a worker would be exposed to average soil concentrations, which are less than the maximum. Nevertheless, the conservative risk estimate of 4.9×10^{-5} is within the USEPA acceptable target cancer risk range of 1×10^{-4} to 1×10^{-6}. Therefore, on-site industrial workers risk associated with exposure to surface soil contamination is not expected to be significant.

The maximum total excess lifetime cancer risk to on-site workers from exposure to sediment contaminated with arsenic is estimated to be 3.7×10^{-5}. This estimate is based on exposure to the maximum detected arsenic concentration of 71.2 mg/kg in the sediment. (The risk estimate was obtained by proportioning the EPA Region 3 risk based level of 1.9 mg/kg, which is based on a risk of 1×10^{-6}.) The risk estimate is conservative as it is likely that worker exposure would not occur only at the area of maximum concentration. Actual worker exposure to arsenic in the sediment would be less since a worker would be exposed to average sediment concentrations, which are less than the maximum. Nevertheless, the conservative risk estimate of 3.7×10^{-5} is within the USEPA acceptable target cancer risk range of 1×10^{-4} to 1×10^{-6}. Therefore, industrial worker risk associated with exposure to surface soil contamination is not expected to be significant.

4 If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

   _____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

   _____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

   _____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code.

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **Caribbean Petroleum Refining, LP** facility, EPA ID # **PRD00632182**, located in Bayamón, Puerto Rico under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by _____ Date 9/29/2004
Sam Ezekwo, Project Manager
RCRA Programs Branch

Supervisor _____ Date 9/29/2004
Dale J. Carpenter, Section Chief
RCRA Programs Branch
EPA Region 2

Approved by _____ Date 9/29/2004
Adolph Everett, Chief
RCRA Programs Branch
EPA Region 2

Locations where References may be found:

U.S. Environmental Protection Agency - Region 2
RCRA File Room
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New York, New York 10007

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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

TABLE 1
Surface Soil - Maximum Concentrations that Exceed Screening Levels
Caribbean Petroleum Refining LP

Soil Contaminant	EPA Region 3 industrial risk-based concentration (RBC)	Units	SWMU 1	SWMU 2	SWMU 3	SWMU 4	SWMU 5	SWMU 6	SWMU 7	SWMU 10	SWMU 11	SWMU 12	SWMU 13	SWMU 32	SWMU 33	SWMU 34	SWMU 35	SWMU 40
Arsenic	1.9	mg/kg	44.4 J	8.6 J	16	--	--	15.3 J	9.3 J	14.7 J	NS	63.2	68.3	NS	13.2	27.9	24.5 J	23.8

Soil Contaminant	EPA Region 3 industrial risk-based concentration (RBC)	Units	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC 7	AOC 8	AOC 9	AOC 10	AOC 11	AOC 12	Tank 203	Process Sewer Area A	Process Sewer Area B	Process Sewer Area C
Arsenic	1.9	mg/kg	43.6 J	75	82.3	3.7 J	13.1	<26.6 J	32.9	< 29	9.5	17.3	93.2	44.3	61.9	NS	NS	NS

Note:

NS (not sampled) - indicates that the contaminant was not sampled for that medium and receptor

-- indicates that the contaminant was not detected above the risk-based screening level

TABLE 2
Subsurface Soil - Maximum Concentrations that Exceed Screening Levels
Caribbean Petroleum Refining LP

Soil Contaminant	EPA Region 3 industrial risk-based concentration (RBC)	Units	SWMU 1	SWMU 2	SWMU 3	SWMU 4	SWMU 5	SWMU 6	SWMU 7	SWMU 10	SWMU 11	SWMU 12	SWMU 13	SWMU 32	SWMU 33	SWMU 34	SWMU 35	SWMU 40
Arsenic	1.9	mg/kg	41.2 J	9.7 J	16.8	--	10.7	7.7 J	16 J	9.4 J	60.1 J	44.1	94.7	18.1	41.5 J	56.6	66.1 J	5 J
Vanadium	1000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	1350	--	--
Benzo(a)anthracene	3900	ug/kg	--	--	--	--	--	--	--	--	9900	--	--	--	--	--	--	--
Benzo(a)pyrene	390	ug/kg	--	--	730	--	--	--	--	--	8200	--	--	--	--	--	--	--

Soil Contaminant	EPA Region 3 industrial risk-based concentration (RBC)	Units	AOC 1	AOC 2	AOC 3	AOC 4	AOC 5	AOC 6	AOC 7	AOC 8	AOC 9	AOC 10	AOC 11	AOC 12	Tank 203	Process Sewer Area A	Process Sewer Area B	Process Sewer Area C
Arsenic	1.9	mg/kg	15.3 J	87 J	79.6 J	11.5 J	28.8	30.8 J	< 23.9 J	36.6	13	54.9	92.4	90.6	138	65.5	45	25.4
Vanadium	1000	mg/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	3900	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	390	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note:

-- indicates that the contaminant was not detected above the risk-based screening level

ARCADIS PUERTO RICO

Appendix D

Hydrogeomorphic Functional Assessment Report

ARCADIS PUERTO RICO

Infrastructure · Water · Environment · Buildings

Imagine the result

PUMA Energy Caribe, LLP

Hydrogeomorphic Functional Assessment Report

Former Caribbean Petroleum Corporation
Refinery/Terminal
Bayamón, Puerto Rico

October 2011

ARCADIS PUERTO RICO

Hydrogeomorphic Functional Assessment Report

Former Caribbean Petroleum Corporation - Refinery/Terminal
Bayamón, Puerto Rico

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Our Ref.:
B0045709

Date:
October 27, 2011

Table of Contents

1. Introduction

On behalf of PUMA Energy Caribe, LLP (PUMA) and pursuant to the requirements of the Agreement and Order on consent between PUMA and the United States Environmental Protection Agency (USEPA), ARCADIS Puerto Rico prepared this Hydrogeomorphic Functional Assessment Report (HGM report) for the former Caribbean Petroleum Corporation Refinery/Terminal located at Road PR-28, km 2, Luchetti Industrial Park in Bayamón, Puerto Rico (the site). The objective of this HGM functional assessment is to compare HGM data collected at an on-site wetland subject to a recent fire and associated management practices, including construction of water control structures (i.e., dikes and berms), to HGM data collected at a reference wetland.

1.1 General Site Setting and History

The site consists of an irregular-shaped, 179-acre parcel of land that includes several one-story buildings, storage tanks, pipelines, appurtenances, and supporting facilities constructed during different phases of site operations. Surface water features on the site include Las Lajas Creek and Diego Creek. Undeveloped wetland areas associated with Las Lajas Creek and Diego Creek comprise a portion of the northernmost 64 acres of the site. The remaining portions of the site include paved parking lots, maintained lawn, and landscaped areas.

The site operated as a petroleum refinery between 1955 and 2000, and continued to operate as a terminal facility for storage of various petroleum products (e.g., gasoline, diesel, jet fuel, and fuel oil) following the discontinuation of refinery operations. The terminal facility is connected via aboveground pipelines to a deepwater port facility with capacity to load and unload fuel products. The former owner rented a portion of its storage capacity to certain customers, including the Puerto Rico Electric Power Authority (PREPA). Other portions of the site were used to store and redistribute petroleum products to their network of service stations located throughout Puerto Rico.

A series of explosions and fires damaged or destroyed many of the on-site storage tanks on October 23, 2009. An unknown quantity of petroleum was released during the incident. Some petroleum products were conveyed in runoff to Las Lajas Creek and an associated wetland to the north of the active portion of the site although it is likely that the fire consumed much of the released material (see **Figure 1**).

PUMA acquired the facility on May 11, 2011. PUMA and the USEPA entered into an Agreement and Order on Consent to implement the requirements of the remedial actions at the facility. The Facility is currently being decommissioned for demolition activities, removal actions, and refurbishing.

1.2 Application of Hydrogeomorphic Approach for the Former Caribbean Petroleum Corporation Refinery/Terminal

The overall objective of this HGM functional assessment is to identify if the October 2009 fire and associated management activities impacted pre-existing ecosystem functionality of the exposed wetland (study wetland). To accomplish that objective, we will compare data collected at the study wetland to data collected at an on-site reference wetland using a modified HGM approach developed from applicable components of HGM approaches currently used in regions with similar wetland ecosystems. A HGM approach is a collection of concepts and methods for developing functional indices, and subsequently using them to assess the capacity of a wetland to perform functions relative to similar wetlands in a region (United States Army Corps of Engineers [USACE] 2002).

The wetlands of Puerto Rico share many plant species with the subtropical wetlands of peninsular Florida (Environmental Laboratory [EL] 1978) although the USACE has not developed a regional guidebook for applying the HGM approach to assess wetlands in Puerto Rico. As such, ARCADIS Puerto Rico selected applicable functions and variables from A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Flats Wetlands in the Everglades (Noble, Evans et al. 2002) and A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Low-Gradient, Backwater Riverine Wetlands in Peninsular Florida (Uranowski, Lin et al. 2003) to allow for comparison of ecosystem functionality between the subject and reference wetlands. Readily available information provided by the United States Fish and Wildlife Service's (USFWS) National Wetlands Inventory (NWI) indicate that portions of the study wetland and reference wetland may be tidally influenced. As such, ARCADIS Puerto Rico also selected applicable functions and variables from A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing the Functions of Tidal Fringe Wetlands along the Mississippi and Alabama Gulf Coast (Shafer, Roberts et al. 2007).

The HGM classification identifies groups of similar wetlands using three criteria that fundamentally influence how wetlands function: (1) geomorphic setting, (2) water source, and (3) hydrodynamics (USACOE 2002). The study wetland contains

characteristics typical of organic flats, tidal fringe wetlands, and low-gradient backwater riverine wetlands based on the classifications offered in the above-mentioned HGM regional guidebooks. ARCADIS Puerto Rico identified an on-site wetland with similar landscape position, geomorphic surfaces, and hydrology that was not exposed to the October 2009 fire to serve as a reference wetland for this HGM functional assessment.

A HGM approach to functional assessment of ecosystems relies on identifying functions performed by a wetland. Ecosystem functions are generally sorted into four groups: hydrology, biogeochemistry, plant community, and faunal habitat. **Table 1** includes the ecosystem functions selected for this HGM functional assessment.

Table 1 Wetland Functions Addressed in the HGM Functional Assessment Comparison

Functional Group	Function	Definition
Hydrology	Surface and subsurface water storage	The ability of a wetland to temporarily store water inputs from (1) direct precipitation, (2) surface water runoff, (3) subsurface water from adjacent uplands, (4) overbank flow of surface water during storm events, and (5) tidal influence when flow is out of the channel
Biogeochemistry	Nutrient cycling	The ability of a wetland to receive, store, and recycle nutrients through biotic and abiotic processes
	Export organic carbon	The ability of a wetland to export dissolved and particulate organic carbon through processes including leaching, flushing, displacement, and erosion
Plant community	Characteristic plant community	The ability of a wetland to promote the development and maintenance of a characteristic plant community, which includes the species composition and physical characteristics of living plant biomass within the wetland
Faunal habitat	Available habitat and connectivity	The ability of a wetland to (1) support a variety of animal populations during all or part of their life cycle by providing heterogeneous habitats, and (2) permit aquatic organisms to enter and leave the wetland via permanent or ephemeral surface channels or corridors

The remainder of this HGM report provides the physical and ecological setting of the study wetland and reference wetland (Section 2), identifies and provides the rationale for selecting the functions and variables used in this HGM report (Section 3), and

summarizes the results of the functional assessment conducted on September 20 and September 21, 2011 (Section 4). Section 5 provides references used to conduct the HGM functional assessment and prepare this HGM report. **Appendix A** provides resumes of the key personnel involved in this functional assessment.

2. Site Background

This section describes the physical and ecological setting of the study wetland and reference wetland in the context of watershed characteristics and land use, hydrologic inputs, soils, and plant community composition. The study wetland and reference wetland are located in a northern coastal valley within the geographic region of the moist coastal northern valleys of Puerto Rico (Ecosystems Associates [EA] 2001). Annual rainfall in this region ranges from 80 to 95 inches (EA 2001). Both wetlands are part of the alluvial plains of the north coast of Puerto Rico, which typically contain highly permeable sandy soils (EA 2001). By the turn of the century, nearly all remaining primary forests in the central and coastal valleys of Puerto Rico were cut to dedicate the land to sugar cane cultivation (EA 2001).

2.1 Physical and Ecological Setting of Study Wetland

PR-22 bounds the study wetland to the north, a slight rise in elevation that abuts a paved road to the east, a slight rise in elevation that provides a natural divide between the study and reference wetlands to the west, and developed portions of the site to the south. Coordinates for the approximate center of the study wetland are 18.25’16.83 Latitude, 66.08’02.24 Longitude. A portion of Las Lajas Creek flows through the center of the study wetland (**Figure 1**).

2.1.1 Topography

Elevation of the study wetland is between two and five feet above mean sea level (amsl), as shown on the United States Geological Survey’s 7.5 minute series Bayamón Quadrangle topographic map. At the time of observation, the study wetland consisted of generally flat terrain with a surface gradient between 0 and 5 percent sloping to the north. These observations are consistent with observations of the study wetland described by EA in 2001.

2.1.2 Soils

The majority of the study wetland contains soils classified by the United States Department of Agriculture (USDA) as Almirante clay, 2 to 5 percent slopes (USDA 2008). A portion of the study wetland to the east contains soils classified by the USDA as Martín Peña muck (USDA 2008). The National Resources Conservation Service (NRCS) lists the Martín Peña muck on the National Hydric Soils List, indicating that these soils frequently coincide with the presence of wetlands (NRCS 2009). Almirante soils are not hydric.

During the field component of the HGM functional assessment, ARCADIS Puerto Rico evaluated soils pursuant to methods presented in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Caribbean Islands Region (Version 2.0) (USACE 2011). Although the soil profiles observed during the field activities did not resemble the soil descriptions for the Martín Peña muck nor Almirante clay, 2 to 5 percent slopes, the soil profiles exhibited the following hydric soil indicators:

- Three soil profiles (i.e., Q1, Q5 and Q8) contained a histic epipedon (i.e., a surface horizon eight inches or more thick of organic soil material)
- Three soil profiles (i.e., Q4, Q6 and Q7) contained a depleted matrix (i.e., a six-inch thick layer within 10 inches of the surface that has 60 percent or more of a depleted matrix with a chroma of two or less)
- Q2 contained a depleted matrix below a dark surface (i.e., a six-inch thick layer within 12 inches of the surface that has 60 percent or more of a depleted matrix with a chroma of two or less)
- Q9 exhibited redox dark surface (i.e., a four-inch thick layer within the upper 12 inches that has a matrix value of three and chroma of two with redox greater than 5 percent concentration)
- Q10 met the criteria for redox depressions (i.e., a depression subject to ponding with a two-inch thick layer that has more than 5 percent redox concentrations entirely in the upper six inches)

The majority of soil profiles did not contain an organic layer at the time of observation.

2.1.3 Watershed Characteristics and Hydrologic Inputs

The Las Lajas Creek is a low-flow, shallow perennial stream that originates in the hills south of the facility, traverses through the north-central part of the facility, and eventually discharges into San Juan Bay. It has undergone significant alterations, including channelization and dredging, impoundment, and subsurface redirection through culverts. The Las Lajas Creek drains to a channelized surface water feature that flows into the San Juan Bay, approximately 2 miles downgradient of the site.

The Las Lajas Creek Watershed consists of a 129-acre basin (see **Figure 2**). The headwaters of the Las Lajas Creek watershed include a mixture of forested outcrops and residential/landscaped areas that drain towards the developed portion of the site. Approximately 30 percent of the watershed is composed of developed land, which includes paved roads, residential housing, and commercial/industrial facilities.

The current hydrology of the study wetland has been modified by anthropogenic alterations to Las Lajas Creek and adjacent lands within the Las Lajas Creek watershed. EA described primary hydrologic input to the study wetland as derived from direct precipitation and surface water runoff from developed areas (EA 2001). At the time of observation, a gabion retaining wall and earthen berm containing a flow control structure had been constructed across Las Lajas Creek as part of the October 2009 fire management activities to help restrict potential downgradient migration of released petroleum product. As designed, the gabion retaining wall and earthen berm appears to have restricted hydrologic connection with the downgradient portion of Las Lajas Creek. These structures have resulted in the partial impoundment of surface water upstream of the earthen berm and in turn, appear to have increased the extent of on-site wetlands associated with Las Lajas Creek.

The USFWS's NWI identified a portion of the study wetland as a tidally influenced emergent estuarine habitat that is irregularly exposed (NWI code: EM1M). At the time of observation, fluctuating water levels were observed in the portion of Las Lajas Creek immediately downgradient of the study wetland, and appeared to be tidally influenced. Those observations support the NWI classification. **Figure 3** presents the USFWS's NWI map, obtained from digitized data available on the USFWS's NWI Wetlands Mapper website (http://www.fws.gov/nwi/).

2.1.4 Historic and Existing Plant Communities

By the turn of the century, nearly all remaining primary forests in the central and coastal valleys of Puerto Rico were cut to dedicate the land to sugar cane cultivation (EA 2001). The existing wetland adjacent to Las Lajas Creek has undergone significant anthropogenic alterations, and is predominantly an herbaceous community dominated by the following six species: southern cattail (*Typha domingensis*), paja brava (*Paspalum millegrana*), sweet potato (*Ipomoea batatas*), Mexican primrose-willow (*Ludwigia octovalvis*), whitemouth dayflower (*Commelina erecta*), and coco yam (*Colocasia esculenta*).

NWI maps identified freshwater forested/shrub, freshwater emergent, and estuarine and marine wetland habitat in the study wetland (see **Figure 3**). Although the wetlands presented on the NWI maps are not field-verified, they do provide preliminary information regarding the potential wetland communities present at a location.

2.2 Physical and Ecological Setting of Reference Wetland

PR-22 bounds the reference wetland to the north, a slight rise in elevation that abuts developed land adjacent to PR-5 to the west, a slight rise in elevation that provides a natural divide between the study and reference wetlands to the east, and developed portions of the site to the south. Coordinates for the approximate center of the reference wetland are 18.4209 Latitude, -66.1365 Longitude. A portion of Diego Creek flows through the center of the reference wetland (**Figure 1**).

2.2.1 Topography

Topography observed in the reference wetland is consistent with observations described by EA in 2001, and similar to topography observed in the study wetland (see Section 2.1.1).

2.2.2 Soils

The majority of the reference wetland contains soils classified by the USDA as Almirante clay, 2 to 5 percent slopes (USDA 2008). A portion of the reference wetland to the south and immediately adjacent to the developed portion of the site contains soils classified by the USDA as Urban land-Vega Alta complex (USDA 2008). Almirante and Urban land-Vega Alta complex soils are not hydric.

During the field component of the HGM functional assessment, ARCADIS Puerto Rico evaluated soils in the reference wetland pursuant to methods presented in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Caribbean Islands Region (Version 2.0) (USACE 2011). Although the soil profiles observed during the field activities did not resemble the soil descriptions Almirante clay, 2 to 5 percent slopes, a soil profile (RQ5) did resemble the variable soil characteristics of Vega Alta complex soils. The remaining soil profiles exhibited the following hydric soil indicator:

- Four soil profiles (i.e., RQ1, RQ2, RQ3 and RQ4) contained a histic epipedon (i.e., a surface horizon eight inches or more thick of organic soil material)

2.2.3 Watershed Characteristics and Hydrologic Inputs

The Diego Creek is shallow low-flow creek that traverses through the northwest portion of the facility, and has undergone alterations, including channelization, dredging, and subsurface redirection through culverts. The Diego Creek drains to a channelized surface water feature that flows into the San Juan Bay, approximately 2 miles downgradient of the site. Although the alterations to the Diego Creek and Las Lajas Creek are similar, the hydrologic connection of the Diego Creek to the San Juan Bay has not been impeded by water control structures.

The Diego Creek watershed consists of a 576-acre basin (see **Figure 2**). The headwaters of the Diego Creek watershed include a mixture of forested outcrops and commercial areas that drain towards the site. Approximately 35 percent of the watershed is composed of developed land, which includes paved roads, commercial properties, and industrial facilities.

The current hydrology of the reference wetland has been modified by anthropogenic alterations to the Diego Creek and adjacent lands within the Diego Creek watershed. Like the study wetland, EA described primary hydrologic input to the reference wetland as derived from direct precipitation and surface water runoff from developed areas (EA 2001). The reference wetland was not exposed to the October 2009 fire, and did not receive associated management activities. As such, the Diego Creek maintained its hydrologic connection to the San Juan Bay.

The USFWS's NWI identified a portion of the reference wetland as tidally influenced emergent estuarine habitat that is irregularly exposed (NWI code: EM1M). Although the portion of the Diego Creek that flows through the reference wetland was

inaccessible during the field activities, it is likely this portion of the Diego Creek is tidally influenced. **Figure 3** presents the USFWS's NWI map, obtained from digitized data available on the USFWS's NWI Wetlands Mapper website (http://www.fws.gov/nwi/).

2.2.4 Historic and Existing Plant Communities

Like the existing wetland adjacent to Las Lajas Creek, the reference wetland has undergone significant anthropogenic alterations. It contains a similar plant community dominated by the following six species: southern cattail, paja brava, sweet potato, coco yam, hairypod cowpea (*Vigna luteola*), and para grass (*Urochloa mutica*).

NWI maps identified wetland habitat in the reference wetland similar to those identified in the study wetland (see **Figure 3**). As stated in Section 2.1.4, the wetlands presented on the NWI maps are not field-verified. However, the NWI maps provide preliminary information regarding the potential wetland communities present at a location.

3. Assessment Model

A HGM assessment model is a simple representation of a function performed by a wetland ecosystem that defines the relationship between one or more characteristics or processes of a wetland ecosystem (Noble, Evans et al. 2002). The HGM approach uses reference wetlands to identify the range of functional performance variability that occurs as a result of natural processes and disturbance, and anthropogenic alteration (Noble, Evans et al. 2002). Reference standard wetlands are the subset of reference wetlands that perform the suite of functions selected for the regional wetland subclass at a level that is characteristic of the least altered sites in the least altered landscapes (Noble, Evans et al. 2002), and are used as the basis for evaluating the functional capacity of a particular wetland. Functional capacity is the ability of a wetland to perform a function as compared to the performance of reference standard wetlands (Noble, Evans et al. 2002).

The objective of this HGM functional assessment is to identify if the October 2009 fire and associated management activities impacted pre-existing ecosystem functionality of the study wetland relative to the reference wetland. As discussed in Section 2, neither the study wetland nor the reference wetland is representative of the least altered sites in the least altered landscapes of Puerto Rico. As such, models, variables, and associated sub-index scores used to assess the functional capacity in this HGM functional assessment are based on those presented in the HGM regional guidebooks, identified in Section 1. ARCADIS Puerto Rico used professional judgment to select

variables, and develop associated sub-index scores and functional models for the following five ecosystem functions:

- Surface and subsurface water storage
- Nutrient cycling
- Export organic carbon
- Characteristic plant community
- Available habitat and connectivity

We have described the functions and variables selected for this HGM functional assessment comparison in the following sections.

3.1 Assessment Variables

Variables represent the characteristics of a wetland ecosystem that influence the capacity of that ecosystem and surrounding landscape to perform a function (Uranowski, Lin et al. 2003). This HGM functional assessment uses 12 variables as inputs into the ecosystem functions.

We have provided a definition and description of each variable in the following sub-sections. Section 3.2 presents the results of each variable for the reference and study wetlands. **Appendix B** provides the HGM functional assessment datasheets that detail the measurements of each variable.

3.1.1 Invasive Vegetation Cover ($V_{INVASIVE}$)

This variable represents the total cover of non-native and invasive vegetation in a wetland, and is defined as the average percent cover of non-native and invasive vegetation in all strata within multiple plots. The presence of non-native or invasive species is considered an indicator of site degradation, and is assumed to downgrade the performance of characteristic plant community maintenance and available wildlife habitat. For this HGM functional assessment, non-native and invasive species are those plant species identified by the Natural Resources Conservation Services Plants Database as introduced to and/or invasive in Puerto Rico (USDA 2011).

Noble, Evans et al. (2002) observed that percent cover of invasive vegetation within flats reference standard wetlands ranged between 0 and 3 percent. It is assumed that cover of invasive vegetation above 3 percent indicates unnatural levels of productivity, changes in hydroperiod, and increased evapotranspiration (Noble, Evans et al. 2002). It is also assumed that invasive and non-native species negatively influence available wildlife habitat in the form of cover and food sources. We have estimated percent cover of non-native and invasive vegetation for the respective wetland using the following procedure to quantify this variable:

- Non-native and invasive species were identified in each 1-m^2 sample plot, and assigned a cover class rank based on the Daubenmire method as described by Barbour, Burke et al. (1999).

- The midpoint of each cover class rank was used to calculate the total percent cover of non-native and invasive species in each sample plot.

- Total percent cover of non-native and invasive species for all sample plots within the respective wetland was averaged.

- A sub-index score was assigned to each wetland based on the sub-index scores for invasive vegetation developed by Noble, Evans et al. (2002) for Organic Flats Everglades wetlands.

3.1.2 Cover of Woody Vegetation (V_{WOODY})

This variable represents the average aerial cover of leaves and stems of woody vegetation (i.e., shrubs, saplings and trees combined), and is measured as the percent cover of woody plants within multiple sample plots, excluding vines. For the purpose of this HGM functional assessment, trees included woody stems more than three inches diameter at breast height (dbh) regardless of height (USACE 2011). Shrubs and saplings included woody plants less than three inches dbh and greater than or equal to 3.28 feet high (USACOE 2011).

Shrub and tree cover data were combined based on the rationale provided by Noble, Evans et al. (2002). In the Everglades reference sites, percent cover of woody vegetation ranged from 0 to 35 percent (Noble, Evans et al. 2002). As percent cover of woody vegetation increases above 3 percent, a linearly decreasing sub-index score down to 0.1 was assigned for wetlands at 80 to 100 percent cover of woody vegetation based on the assumption that the amount of woody vegetation cover is linearly related

to levels of evapotranspiration (Noble, Evans et al. 2002). It was also assumed that if woody cover reached 80 to 100 percent, evapotranspiration would not prevent the site from being inundated during most years, but would reduce the duration of inundation (Noble, Evans et al. 2002).

The percent cover of woody vegetation for the respective wetland was identified using the following procedure:

- The percent of the ground surface covered by woody vegetation was visually estimated in each 10-meter radius sample plot.
- The percent of woody vegetation cover from all of the plots within the respective wetland was averaged and reported as a percent between 0 and 100.
- A sub-index score was assigned for each wetland based on the woody vegetation sub-index scores developed by Noble, Evans et al. (2002) for Flats Everglades wetlands.

3.1.3 Surface Soil Texture (V_{SURTEX})

This variable represents the USDA soil texture of the surface horizon or layer of the soil profile (i.e., upper 12 inches from the soil surface) typically found in a wetland. Soil is the medium on which and in which water is stored (Noble, Evans et al. 2002). Soil texture observed by Noble, Evans et al. (2002) in the Everglades ranged from marl or muck to gravel. Based on reference standard sites, muck was the soil texture typical of Organic Flats (Noble, Evans et al. 2002). Other USDA's textural classes, received categorically lower sub-index scores down to zero for gravel, bedrock, and pavement.

Although sub-index scores for soil texture have not been identified for wetlands in Puerto Rico, it is assumed the soil texture sub-index scores developed by Noble, Evans et al. (2002) should adequately characterize surface and subsurface water storage capacity and available wildlife habitat. For the purpose of this HGM functional assessment, soil textures identified as fibric-organic are assumed to have similar properties as muck, soil textures identified as silty clay are assumed to have similar properties as clay, and soil textures identified as silty clay loam are assumed to have similar properties as loam. Surface soil texture for the respective wetland was determined using the following procedure:

- The texture class of the surface horizon was estimated using the texture by feel method[1] in each of the 1-m^2 sample plot.

- A sub-index score was assigned for each soil profile based on the soil texture sub-index scores developed by Noble, Evans et al. (2002) for Organic Flats Everglades wetlands (see **Table 2**). If a soil profile contained multiple soil texture classes, the soil texture sub-index score was calculated as a weighted average based on the total thickness of each texture class within the 12-inch soil profile.

- The sub-index value was determined by averaging the scores from each of the sample plots within the respective wetland.

Table 2 Soil Surface Texture for Organic Flats Everglades Wetlands

Soil Texture	Sub-Index Score
Muck/Organic[1]	1.0
Marl[1]	0.8
Silt	0.9
Silt loam	0.9
Loam	0.5
Gravelly silt loam (15 percent to <35 percent gravel)	0.4
Gravely silt (15 percent to <35 percent gravel)	0.4
Very gravely silt loam (35 percent to <60 percent gravel)	0.3
Very gravelly silt (35 percent to 1<60 percent gravel)	0.3
Sandy loam	0.2
Clay	0.2
Sand	0.2
Loamy sand	0.2
Extremely gravely silt loam (60 percent to <90 percent gravel)	0.2
Extremely gravely silt (60 percent to <90 percent gravel)	0.2
Gravel[1] (≥90 percent gravel)	0.1
Rock	0.0

[1] The methods used to determine soil texture by feel were adapted from methods presented in Agronomy Education (Thien 1979) and the USACE Regional Supplement to the Corps of Engineers Wetland delineation Manual: Midwest Region (Version 2.0) (USACOE 2010).

Soil Texture	Sub-Index Score
Pavement[2]	0.0

3.1.4 Average O-Horizon Thickness ($V_{OHORIZON}$)

This variable represents the average total thickness of the O-horizon observed in a wetland. Organic soils exhibit a greater water holding capacity than mineral soils (Mitsch and Gosselink 2000). As such, surface soil texture contributes to water storage capacity (Noble, Evans et al. 2002). O-horizon biomass is also indicative that nutrients in the organic matter are being recycled (Uranowski, Lin et al. 2003). Since reference standard wetlands observed by Noble, Evans et al. (2002) contained soil profiles high in organic content, and Uranowski, Lin et al. (2003) established a positive linear trend between the percent cover of the O-horizon and nutrient cycling, it is assumed that O-horizon thickness within a wetland would contribute to water storage and nutrient cycling. Based on this assumption and information provided by the regional guidebooks, it is likely that O-horizon thickness exhibits a relationship to functional capacity similar to the relationship presented by Uranowski, Lin et al. (2003) for O-horizon biomass. Average O-horizon thickness for the respective wetland was calculated using the following procedure:

- The O-horizon thickness within a 12-inch soil profile was measured in each 1-m^2 sample plot.
- O-horizon thickness for all sample plots within the respective wetland was averaged.
- The average O-horizon thickness was then reported as a percent of the 12-inch soil profile.
- A sub-index score was assigned for each wetland based on the O-horizon biomass sub-index scores developed by Uranowski, Lin et al. (2003) for low-gradient blackwater riverine wetlands in peninsular Florida.

[2] Term used in lieu of texture.

3.1.5 Herbaceous Vegetation Cover (V_{HERB})

This variable represents the total cover of herbaceous vegetation in a plant community of a wetland, exclusive of submerged aquatic vegetation and periphyton. Herbaceous vegetation cover is assumed to contribute to the functions of nutrient cycling, characteristic plant community, and available wildlife habitat. Although not measured, 0 percent cover of emergent macrophytic vegetation in Organic Flats was assumed to indicate severely altered conditions (Noble, Evans et al. 2002). Noble, Evans et al. (2002) observed from data collected in Organic Flats that as cover of emergent macrophytic vegetation increased from zero, functionality was observed to linearly increase until a maximum level of functionality was reached between 22 and 42 percent. As cover of emergent macrophytic vegetation increased above 42 percent, functionality was anticipated to decrease as cover reached 100 percent. This was based on the assumption that the increase in emergent macrophytic vegetation cover indicates unnatural levels of productivity (Noble, Evans et al. 2002) and a reduction in available wildlife habitat. It was however assumed that cover of emergent vegetation in excess of the optimal range still contributes to nutrient cycling, characteristic plant community, and available wildlife habitat.

Although sub-index scores for total cover of herbaceous vegetation have not been identified for wetlands in Puerto Rico, it is assumed the sub-index scores for macrophytic vegetation in Organic Flats developed by Noble, Evans et al. (2002) should adequately characterize the relationship between herbaceous vegetation cover and functional capacity. Percent cover of herbaceous vegetation for the respective wetland was estimated using the following procedures to quantify this variable:

- All species were identified in each 1-m^2 sample plot and assigned a cover class rank based on the Daubenmire method as described by Barbour, Burke et al. (1999).
- The midpoint of each cover class rank was used to calculate the total percent cover of each sample plot.
- The total percent cover for all sample plots within the respective wetland was averaged.

- A sub-index score was assigned to each wetland based on the sub-index scores for the percent cover of macrophytic vegetation developed by Noble, Evans et al. (2002) for Organic Flats Everglades wetlands.

3.1.6 Plant Species Composition (V_{COMP})

This variable represents the composition of dominant species currently indentified in the study wetland and reference wetland with respect to the composition of dominant species identified in both wetlands observed during a wetland assessment conducted before the October 2009 fire by EA in 2001. In Everglades' reference wetlands, percent concurrence with dominant species ranged from 0 to 100 percent (Noble, Evans et al. 2002). Based on the data from reference standard sites, Noble, Evans et al. (2002) assigned a variable sub-index of one when concurrence with dominant species was 100 percent for a wetland subclass. As percent concurrence decreased, a linearly decreasing sub-index down to zero was assigned based on the assumption that the relationship between plant species composition and the capacity of Everglades wetlands to maintain a characteristic plant community and available wildlife habitat is linear (Noble, Evans et al. 2002).

Ideally, plant species composition would be determined for numerous reference sites to identify the plant species composition, and establish a variable sub-index with respect to the least disturbed wetland systems in Puerto Rico. The objective of this HGM functional assessment is however to compare current conditions in the study wetland and reference wetland relative to conditions that existed before the October 2009 fire. As such, the percent occurrence of dominant species will be calculated for the study and reference wetlands with respect to the dominant species identified in the on-site wetland during a wetland assessment conducted in 2001. Percent concurrence was quantified using the following procedure:

- Dominant species were identified in 1-m^2 sample plots using the 50/20 rule, as described by Tiner (1999). Species were ranked in descending order based on total percent cover. Dominants were identified by summing the relative cover for each ranked species in descending order until 50 percent was exceeded. If multiple species had equal values for percent cover and the 50 percent threshold had not been exceeded, all species with that percent cover value were considered dominants. Additional species that individually represented greater than 20 percent relative cover were also considered dominant.

- Percent concurrence was calculated by comparing the list of dominant plant species in the respective wetland to the list of dominant species identified during the 2001 wetland assessment. For example, if all the dominants from the area being assessed occur on the list of dominants from reference standard wetlands, then there is 100 percent concurrence. If three of the five dominant species from the area being assessed occur on the list, then there is a 60 percent concurrence.

- A sub-index score was assigned to each wetland based on the sub-index scores for plant species composition developed by Noble, Evans et al. (2002) for Organic Flats Everglades wetlands.

3.1.7 Tree Basal Area (V_{TREE})

This variable represents the total mass of organic material per unit area in trees that occupy a wetland. Trees are defined as woody stems greater than three inches dbh regardless of height (USACOE 2011).

Basal area is the area occupied by the tree stems, and represents the mass of organic material per unit area in the tree stratum (Uranowski, Lin et al. 2003). Tree basal area indicates to what extent trees are present, taking up nutrients, and producing biomass. Although basal area ranges have not been established for wetlands in Puerto Rico, it is assumed that the relationship between tree basal area and a wetlands capacity to cycle nutrients is linear, as observed by Uranowski, Lin et al. (2003). Tree basal area for the respective wetland was determined using the following procedure:

- The species and dbh of each tree within each 20-meter diameter sample plot was recorded.

- Dbh measurements for each 20-meter sample plot were converted to area, summed, and then converted to square meters.

- The results from all sample plots within the respective wetland were averaged and converted to a per-hectare basis.

- A sub-index score was assigned to each wetland based on the sub-index scores for tree biomass developed by Uranowski, Lin et al. (2003).

3.1.8 Density of Understory (V_{SSD})

This variable represents the amount of woody vegetation (i.e., shrubs and saplings) per unit area in the sapling/shrub stratum of a wetland. For this HGM functional assessment comparison, the sapling/shrub stratum consisted of woody plants less than three inches dbh and greater than or equal to 3.28-feet tall, exclusive of woody vines (USACE 2011).

As discussed by Uranowski, Lin et al. (2003), understory density is inversely related to tree basal area in a mature riverine forest (i.e., as tree basal area increases with maturity, shrub and sapling density decreases). Understory vegetation density may therefore serve as an indicator of habitat structure (Uranowski, Lin et al. 2003). Understory biomass density likely contributes to nutrient cycling.

In west-central peninsular Florida reference wetlands, understory vegetation stem density ranged from zero to nearly 2,500 stems/ha (Uranowski, Lin et al. 2003). Based on data from reference standard sites, Uranowski, Lin et al. (2003) assigned a variable sub-index of one to wetlands when understory vegetation stem density was between 150 and 1,400 stems/ha. As understory stem density decreased, the assigned sub-index linearly decreased to zero at zero stems/ha. This was based on the assumption that if understory vegetation does not exist, it does not contribute to functional capacity (Uranowski, Lin et al. 2003). A linearly decreasing sub-index was assigned as understory vegetation stem density increased from 1,400 stems/ha to 1,900 stems/ha and above (Uranowski, Lin et al. 2003).

Although the optimal range for understory vegetation stem density has not been identified for wetlands in Puerto Rico, it is likely that the relationship between the density of the understory and a wetland's capacity to cycle nutrients and provide wildlife habitat is similar to the relationship observed by Uranowski, Lin et al. (2003). The density of understory biomass was calculated for each wetland using the following procedure:

- All shrubs and saplings within multiple six-meter diameter sample plots of the respective wetland were counted.
- Density of shrubs and saplings per hectare was calculated from the total counts.
- A sub-index score was assigned to each wetland based on the sub-index scores for understory vegetation biomass developed by Uranowski, Lin et al. (2003).

3.1.9 Woody Debris (V_{WD})

This variable represents the amount of woody debris on or near the surface of the ground. For the purpose of this HGM functional assessment, woody debris is defined as down and dead woody stems greater than three inches in diameter that are no longer attached to living plants.

Despite its relatively slow turnover rate, woody debris is an important component of food webs, nutrient cycles, and wildlife habitat (Uranowski, Lin et al. 2003). Although the optimal range for the amount of woody debris has not been identified for wetlands in Puerto Rico, it is likely the relationship between woody debris biomass and the functional capacity of nutrient cycling, exportation of organic carbon, and the spatial structure and available wildlife habitat is similar to the relationship observed by Uranowski, Lin et al. (2003). Volume of woody debris for the respective wetland was estimated using the following procedure:

- The length and diameter was measured to the nearest centimeter for all woody debris observed in each 1-m^2 sample plot. The volume of each piece of woody debris was calculated and converted to meters cubed (m^3).

- The volume of woody debris observed in the sample plots was averaged and converted to m^3 per hectare.

- A sub-index score was assigned to each wetland based on the sub-index scores for woody debris biomass developed by Uranowski, Lin et al. (2003).

3.1.10 Hydrologic Regime (V_{HYDRO})

This variable represents the degree of hydrologic alteration to a wetland, which would impact the natural connection of upstream and downstream water sources (e.g., tidal flushing and stream flow). A natural connection to upstream and downstream water sources is assumed to contribute to the exportation of organic carbon and habitat connectivity for aquatic species. As discussed by Shafer, Roberts et al. (2007), it is not practical to install and monitor water level recorders at each wetland assessment area. As such, this variable was evaluated based on the degree of hydrologic alteration present with a particular wetland. Hydrologic regime functional values were estimated for the respective wetland using the following procedure, based on guidance provided by Shafer, Roberts et al. (2007):

- The wetland was visually inspected to identify if there was any evidence of hydrological alteration (e.g., berms, culverts or fill) that could affect normal tidal hydrology or stream flow. The value of the variable sub-index was assumed to be one unless any of the altered conditions described in **Table 3** were observed.

- A sub-index score was assigned to each wetland by matching the site condition with the variable associated sub-index score from **Table 3**.

Table 3 Relationship between Hydrologic Regime and Functional Capacity

Site Condition	Sub-Index Score
Wetland is open to free exchange of tidal waters and normal stream flow; no obvious hydrologic alteration, fill, or restrictions present	1.00
Minor hydrologic alteration or restriction present (i.e., presence of low-elevation berm, which is frequently overtopped by high-tide events or has multiple breaches or large culverts); presence of some fill that raises a small portion (<20 percent of marsh area) of marsh surface above normal tidal flooding zone	0.75
Moderate hydrologic alteration present (i.e., presence of high-elevation berm, which is infrequently overtopped by high-tide events or has a single opening, breach, or small culvert); greater extent of fill (>20 percent) that raises portions of the wetland surface elevation above normal tidal flooding zone	0.50
Severe hydrologic alteration; site only receives tidal floodwaters during extreme tide events (i.e., surface elevation of wetland is above normal tidal flooding zone; blocked culvert, etc.)	0.25
Site is isolated from tidal exchange; the principal source of flooding is water sources other than tidal action (i.e., precipitation or groundwater)	0.00

3.1.11 Habitat Connections ($V_{CONNECT}$)

This variable represents the percentage of the wetland that is connected to other types of wetlands, upland forests, or other suitable wildlife habitat. Agricultural fields, mined areas, or developed areas are not considered suitable habitat (Noble, Evans et al. 2002). An adjacent habitat is considered connected if it is within half kilometer of the perimeter of the wetland, which is the most restrictive distance between connected and disconnected habitats as identified from the literature (Noble, Evans et al. 2002), unless it is separated by a road crossing or other impassable feature, based on professional judgment.

Based on data from reference standard sites for flats wetlands in the Everglades, a sub-index of one was assigned when 75 percent or more of the wetland tract perimeter was connected to suitable wildlife habitat (Noble, Evans et al. 2002). As the percentage of wetland tract perimeter decreased, a linearly decreasing sub-index was assigned down to zero at zero percent connected wetland perimeter. As connections to other suitable habitats decrease, so does the suitability of the wetland tract as habitat for wide-ranging species or for those that require other habitats for a portion of their life cycle (Noble, Evans et al. 2002). Although index scores for habitat connections have not been identified for wetlands in Puerto Rico, it is assumed that wildlife habitat functionality exhibits a similar linear relationship to habitat connection, as observed by Noble, Evans et al. (2002).

The percentage of the perimeter of the wetland tract that is directly adjacent to or connected was calculated using the following procedure:

- The total length of the wetland tract perimeter was measured using recent aerial photography.
- The length of the wetland connected to suitable habitat, such as other types of wetlands, upland forest, or other wildlife habitats, was measured.
- The length of connected wetland perimeter was divided by the total length of the wetland perimeter, and converted to a percentage of the perimeter.
- A sub-index score was assigned to each wetland based on the sub-index scores for habitat connections developed by Noble, Evans et al. (2002).

3.1.12 Wetland Core (V_{CORE})

This variable represents the percent of the wetland that has at least a 990-foot buffer separating it from adjacent habitat, which is referred to as interior core area. Interior core area is dictated by both the size and shape of the wetland (Noble, Evans et al. 2002). The percentage of interior core observed in Everglades Flats reference standard wetlands ranged from 49 to 95 percent (Noble, Evans et al. 2002). It was assumed that as the interior core area decreased below 49 percent, the suitability of the wetland tract for species requiring isolation from predators that frequent edges would likewise decrease. Although a minimum interior core percentage has not been identified for wetlands in Puerto Rico, it is assumed that that wildlife habitat functional capacity of a wetland exhibits a similar relationship to the percent interior core within

a wetland, as observed by Noble, Evans et al. (2002). The percentage of interior core was calculated using the following procedure:

- The area of the wetland within a buffer of 990 feet was measured using current aerial photography.
- The area of the wetland within the buffer was divided by the total size of the wetland, and converted to a percentage.
- A sub-index score was assigned to each wetland based on the sub-index scores for the percentage of interior core area developed by Noble, Evans et al. (2002).

3.2 Assessment Model Functions

3.2.1 Surface and Subsurface Water Storage

Surface and subsurface water storage is the presence of conditions that allow water source, storage, and outflow dynamics to occur in a manner typical of similar wetlands in a region (Noble, Evans et al. 2002). The capacity of a wetland to store surface and subsurface water is critical to the integrity of the ecosystem (Noble, Evans et al. 2002). Wetland hydrology is probably the single most important determinant of the establishment and maintenance of specific types of wetlands and wetland processes (Mitsch and Gosselink 2000).

The following variables were used in the assessment model for the function Surface and Subsurface Water Storage:

- Invasive Vegetation Cover ($V_{INVASIVE}$)
- Cover of Woody Vegetation (V_{WOODY})
- Surface Soil Texture (V_{SURTEX})
- Average O-Horizon Thickness ($V_{OHORIZON}$)

The assessment model used to calculate the functional capacity index (FCI) is as follows:

$$FCI = \left(\frac{V_{INVASIVE} + V_{WOODY} + V_{SURTEX} + V_{OHORIZON}}{4} \right)$$

In this model, the soil texture V_{SURTEX} and the assumed volume of organic material in a wetland $V_{OHORIZON}$ influence a wetlands ability to hold water. The presence of invasive species $V_{INVASIVE}$ and woody vegetation V_{WOODY} within a wetland likely affect the rate of evapotranspiration. All variables are averaged together because it is unclear if any variable is more important from the standpoint of water storage.

Table 4 Function 1 - Surface and Subsurface Water Storage

Wetland	Variable Scores				FCI
	V_{SURTEX}	$V_{OHORIZON}$	$V_{INVASIVE}$	V_{WOODY}	
Reference	0.87	0.80	0.20	1.00	0.72
Study	0.43	0.15	0.45	1.00	0.53

3.2.2 Characteristic Plant Community

Many attributes and processes, such as primary productivity, nutrient cycling, and the ability to provide a variety of habitats to maintain diverse wildlife populations, are directly influenced by the plant community of a wetland (Noble, Evans et al. 2002). As such, the ability to maintain a characteristic plant community is important to providing stability for those attributes and processes.

The following variables were used in the assessment model for the function Characteristic Plant Community:

- Herbaceous Vegetation Cover (V_{HERB})
- Invasive Vegetation Cover ($V_{INVASIVE}$)
- Plant Species Composition (V_{COMP})
- Surface Soil Texture (V_{SURTEX})

The assessment model used to calculate the FCI is as follows:

$$FCI = \left\{ \left[\frac{\left[\frac{V_{HERB} + V_{INVASIVE}}{2} \right] + V_{COMP}}{2} \right] X \; V_{SURTEX} \right\}^{½}$$

In this model, the capacity of a wetland to maintain a characteristic plant community is dependent of the existing vegetation and soils. The percent cover of herbaceous vegetation (V_{HERB}) and invasive species ($V_{INVASIVE}$) is averaged because it is assumed these variables contribute equally to the plant community. Similar to the FCI developed by Noble, Evans et al. (2002), plant species composition is averaged with the result of the average of V_{HERB} and $V_{INVASIVE}$ to add greater weight to plant species composition V_{COMP}.

Surface soil texture V_{SURTEX} and the result for the vegetation components are averaged using a geometric mean based on the assumption that both species composition and soil factors equally contribute to the maintenance of a characteristic plant community. If the sub-indices for the variables in either part of the model decrease, there will be a reduction in the FCI to zero if either part equals zero.

Table 5 Function 2 - Characteristic Plant Community

Wetland	Variable Scores				FCI
	V_{HERB}	$V_{INVASIVE}$	V_{COMP}	V_{SURTEX}	
Reference	0.20	0.20	0.33	0.87	0.48
Study	0.20	0.45	0.44	0.43	0.40

3.2.3 Nutrient Cycling

Nutrient cycling is defined as the ability of a wetland to receive nutrient inputs; store nutrients in biotic and abiotic pools; circulate and transform nutrients through living and dead organic matter; replenish nutrients through decomposition and weathering; and remove nutrients through leaching, gaseous, and other losses (Uranowski, Lin et al. 2003). As discussed by Uranowski, Lin et al. (2003), nutrient cycling maintains the

proper amount of available nutrients in a wetland ecosystem. The loss of nutrients in the system would result in decreased primary and secondary production, as well as reduced rates of decomposition (Uranowski, Lin et al. 2003). In this model, specific nutrients are not considered individually. Instead, all nutrients in general are considered by this function, which represents the amount of nutrients processed by a wetland over a period of a year or less. The following variables were used in the assessment model for the function Nutrient Cycling:

- Herbaceous Vegetation Cover (V_{HERB})
- Tree Basal Area (V_{TREE})
- Density of Understory (V_{SSD})
- Surface Soil Texture (V_{SURTEX})
- Average O-Horizon Thickness ($V_{OHORIZON}$)
- Woody Debris (V_{WD})

The assessment model used to calculate the FCI is as follows:

$$FCI = \frac{\left[\frac{V_{TREE} + V_{HERB} + V_{SSD}}{3}\right] + \left[\frac{V_{OHORIZON} + V_{SURTEX} + V_{WD}}{3}\right]}{2}$$

In this model, the capacity of a wetland to cycle is dependent on characteristics of the existing vegetation and soils. Similar to the FCI developed by Uranowski, Lin et al. (2003), the presence of all strata of the plant community is represented by the model variables V_{TREE}, V_{SSD}, and V_{HERB}. These partially compensatory variables (Smith and Wakeley 2001) are combined using an arithmetic mean, based on an assumption of equal importance for each stratum of the plant community, and the fact that the total loss of one of the strata (i.e., a variable subindex of zero) would not cause nutrient cycling to cease. The presence of long- and short-term detrital and soil components is represented by the variables $V_{OHORIZON}$, V_{SURTEX}, and V_{WD}. These partially compensatory variables are averaged based in the assumption that all detrital components are given equal importance in nutrient cycling (Uranowski, Lin et al., 2003). The two parts of the model are averaged because the production and

decomposition processes in nutrient cycling are considered to be interdependent and equally important (Uranowski, Lin et al., 2003).

Table 6 Function 3 - Nutrient Cycling

Wetland	Variable Scores						FCI
	V_{HERB}	V_{TREE}	V_{SSD}	V_{SURTEX}	$V_{OHORIZON}$	V_{WD}	
Reference	0.2	0.0	0.0	0.87	0.80	0.0	0.31
Study	0.2	0.0	1.0	0.43	0.15	0.0	0.30

3.2.4 Export Organic Carbon

This function is defined as the capacity of a wetland to export dissolved and particulate organic carbon through processes, including: leaching, flushing, displacement, and erosion. Dissolved organic carbon is a significant source of energy for the microbes that form the base of the detrital food web in aquatic ecosystems (Uranowski, Lin et al. 2003). The high productivity and close proximity of riverine wetlands to streams make them important sources of dissolved and particulate organic carbon for aquatic food/detrital webs and biogeochemical processes in downstream aquatic habitats.

The following variables were used in the assessment model for the function Export Organic Carbon:

- Woody Debris (V_{WD})
- Average O-Horizon Thickness ($V_{OHORIZON}$)
- Hydrologic Regime (V_{HYDRO})

The assessment model used to calculate the FCI is as follows:

$$FCI = \left\{ \left[\frac{V_{WD} + V_{OHORIZON}}{2} \right] X \; V_{HYDRO} \right\}^{½}$$

In this model, the sources of dissolved and particulate organic carbon are represented by V_{OHOR} and V_{WD}, and are averaged because it is unlikely that either variable has the ability to independently cease or significantly decrease functional capacity. V_{HYDRO} reflects whether the mechanism for exporting organic carbon from the wetland is in place.

The average of V_{OHOR}, V_{WD}, and V_{HYDRO} are averaged by taking the geometric mean because either subpart is independently capable of significantly reducing the amount of carbon being exported (Uranowski, Lin et al. 2003). If an organic matter source is not present, carbon export will not occur. Similarly, if the transport vector is absent, carbon export will decrease or cease (Uranowski, Lin et al. 2003).

Table 7 Function 4 - Export Organic Carbon

Wetland	Variable Scores			FCI
	V_{WD}	$V_{OHORIZON}$	V_{HYDRO}	
Reference	0.00	0.80	1.00	0.63
Study	0.00	0.15	0.00	0.00

3.2.5 Available Habitat and Connectivity

This model is assumed to reflect the habitat necessary to provide food, cover, and nesting opportunities for birds and other wildlife species. Similar to the FCI model developed by Noble, Evans et al. (2002), the variables are grouped into the three major components: landscape, soils and structure, and plant community. This model considers on-site conditions and connectivity with adjacent habitat. The emphasis is however on on-site conditions. Even in largely fragmented landscapes, the majority of wildlife species will use the site during certain seasons or for part of their life cycle if reference standard conditions exist on the site (Noble, Evans et al. 2002).

The following variables were used in the assessment model for the function Available Habitat and Connectivity:

- Herbaceous Vegetation Cover (V_{HERB})
- Invasive Vegetation Cover ($V_{INVASIVE}$)
- Plant Species Composition (V_{COMP})

- Surface Soil Texture (V_{SURTEX})
- Woody Debris (V_{WD})
- Density of Understory (V_{SSD})
  - Hydrologic Regime (VHYDRO)
  - Habitat Connections (VCONNECT)
  - Wetland Core (VCORE)

The assessment model used to calculate the FCI is as follows:

$$FCI = \left(\frac{V_{SURTEX} + V_{WD} + V_{SSD} + V_{HERB} + V_{INVASIVE} + V_{COMP} + \left[\frac{V_{HYDRO} + V_{CONNECT} + V_{CORE}}{3} \right]}{7} \right)$$

The variables Habitat Connections ($V_{CONNECT}$), Interior Core Area (V_{CORE}), and Wetland Hydrologic Regime (V_{HYDRO}) reflect landscape scale attributes of the wetland and the landscape in which the wetland is located. V_{CORE} represents the size of the wetland. $V_{CONNECT}$ and V_{HYDRO} represent the isolation of the wetland from adjacent suitable habitats. The plant community structure is represented by the individual components Herbaceous Vegetation Cover (V_{HERB}), Plant Species Composition (V_{COMP}), and Invasive Vegetation Cover ($V_{INVASIVE}$). Woody Debris (V_{WD}), Density of Understory (V_{SSD}), and Soil Surface Texture (V_{SURTEX}) are used in this function as an indication of habitat structure available to vertebrates (e.g., birds, mammals and reptiles) and invertebrates that live in the soil.

The landscape level features (i.e., $V_{CONNECT}$, V_{CORE}, and V_{HYDRO}) are considered equally and averaged. The habitat structure features (i.e., V_{SURTEX}, V_{WD}, and V_{SSD}) and plant community level features (i.e., V_{HERB}, $V_{INVASIVE}$, and V_{COMP}) are also considered of equal weight, but are averaged with the average of the landscape features to give greater weight to the on-site habitat variables. In other words, if the on-site community is degraded, the use of the wetland area by wildlife species will decrease even in a relatively un-fragmented landscape with intact hydrology.

Table 8 Function 5 - Available Habitat and Connectivity

Wetland	Reference	Study
V_{HERB}	0.2	0.2
$V_{INVASIVE}$	0.2	0.45
V_{COMP}	0.33	0.44
V_{SURTEX}	0.87	0.43
V_{WD}	0	0
V_{SSD}	0	1
V_{HYDRO}	1	0
$V_{CONNECT}$	0.8	1
V_{CORE}	0	0
FCI	0.31	0.41

4. Summary

This section presents and discusses the resulting FCI scores for the reference wetland and study wetland. **Table 9** presents the FCI score of each wetland function for the respective wetland.

Table 9 FCI Score Results

Functional Group	Function	FCI Scores	
		Reference Wetland	Study Wetland
Hydrology	Surface and subsurface water storage	0.72	0.53
Biogeochemistry	Nutrient cycling	0.31	0.30
	Export organic carbon	0.63	0.00
Plant community	Characteristic plant community	0.48	0.40
Faunal habitat	Available habitat and connectivity	0.31	0.41

A comparison of the FCI scores indicates that surface and subsurface water storage performance is reduced in the study wetland relative to the reference wetland. This is likely due to the lack of organic material in the study wetland surface soil layer as a

result of the October 2009 fire. It is however expected that the organic layer will be replenished over time.

Due to the presence of a shrub stratum in the study wetland, FCI scores for nutrient cycling appear to be relatively similar. It is however expected that nutrient cycling performance of the study wetland will surpass nutrient cycling performance of the reference wetland as the organic layer in the study wetland is replenished over time.

The FCI for export of organic carbon is driven by the presence of organic material and downstream hydrologic connections. The water control structures in the study wetland significantly limit downgradient migration of dissolved and particulate organic carbon. As expected, the FCI score for the study wetland indicates that performance of this function in the study wetland is severely limited. Functional performance of the study wetland, however, would likely increase with the removal of the water control structures.

FCI scores for the maintenance of a characteristic plant community appear to be relatively similar. Performance of the study wetland is expected to increase as the organic layer in the study wetland is replenished.

Although hydrologic connection contributes to the functional performance of available habitat and connectivity, on-site variables are given more weight in the FCI. As such, the study wetland currently outperforms the reference wetland primarily due to the presence of a shrub stratum in the study wetland. Functional performance of the study wetland will likely continue to increase when the hydrologic connection with the downstream portion of Las Lajas Creek is restored with the removal of the water control structures.

Additionally, it appears that maintenance activities performed in Las Lajas Creek (i.e., hand cleaning of the portion of the Las Lajas Creek flowing though the study wetland) have increased available open water habitat and land-water edge in the study wetland relative to the reference wetland. As observed by Adamus, Stockwell et al. (1991), the amount of available open water habitat and a diverse connection of habitat edges directly influence habitat utilization. This unintentional increase in habitat diversity has appeared to increase faunal utilization of the study wetland despite the lack of hydrologic connection with downstream portions of Las Lajas Creek. Additional habitat enhancement activities implemented through the process of adaptive management would likely increase functional performance and faunal utilization of on-site wetland and other habitats.

5. References

Adamus, P.R., L.T. Stockwell, E.J. Clairain, M.E. Morrow, L.D. Rozas, and R.D. Smith. 1991. Wetland Evaluation Technique (WET), Volume I, Literature Review and Evaluation Rationale. Technical Report WRP-DE-2, U.S. Department of the Army, Waterways Experiment Station, Vicksburg, MS.

Barbour, M.G., J.H. Burk, W.D. Pitts, F.S. Gilliam, and M.W. Swartz. 1999. Terrestrial Plant Ecology, Third Edition. California: Benjamin/Cummings.

Ecosystem Associates. 2001. Jurisdictional Determination, Caribbean Petroleum Corp., Bayamón, Puerto Rico. Prepared for Caribbean Petroleum Corp. February 2001.

Environmental Laboratory. 1978. Preliminary Guide to Wetlands of Puerto Rico – Major Associations and Communities Identified. Technical Report Y-78-3. April 1978. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

ERDC/EL TR-07-2. April 2007. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Liogier, H.A., and L.F. Martorell. 2000. Flora of Puerto Rico and adjacent islands: a systematic synopsis, Second Edition. Universidad de Puerto Rico.

Mitsch, J.M., and J.G. Gosselink. 2000. Wetlands, Third Edition. NY: John Wiley & Sons, Inc.

Noble, C.V., R. Evans, M. McGuire, K. Trott, M. Davis, and E.J. Clairain, Jr. 2002. A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Flats Wetlands in the Everglades. Technical Report ERDC/EL TR-02-19. July 2002. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Shafer, D.J., T.H. Roberts, M.S. Peterson, and K. Schmid. 2007. A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing the Functions of Tidal Fringe Wetlands along the Mississippi and Alabama Gulf Coast.

Smith, R.D., and J.S. Wakeley. 2001. Hydrogeomorphic Approach to Assessing Wetland Functions; Guidelines for Developing Regional Guidebooks. Technical Report

ERDC/EL TR-01-30. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Thien, S.J. 1979. Determining Soil Texture by the Feel Method. Agronomy Education. Kansas State University.

Tiner, R.W. 1999. Wetland Indicators – A Guide to Wetland Identification, Delineation, Classification, and Mapping. Lewis Publishers.

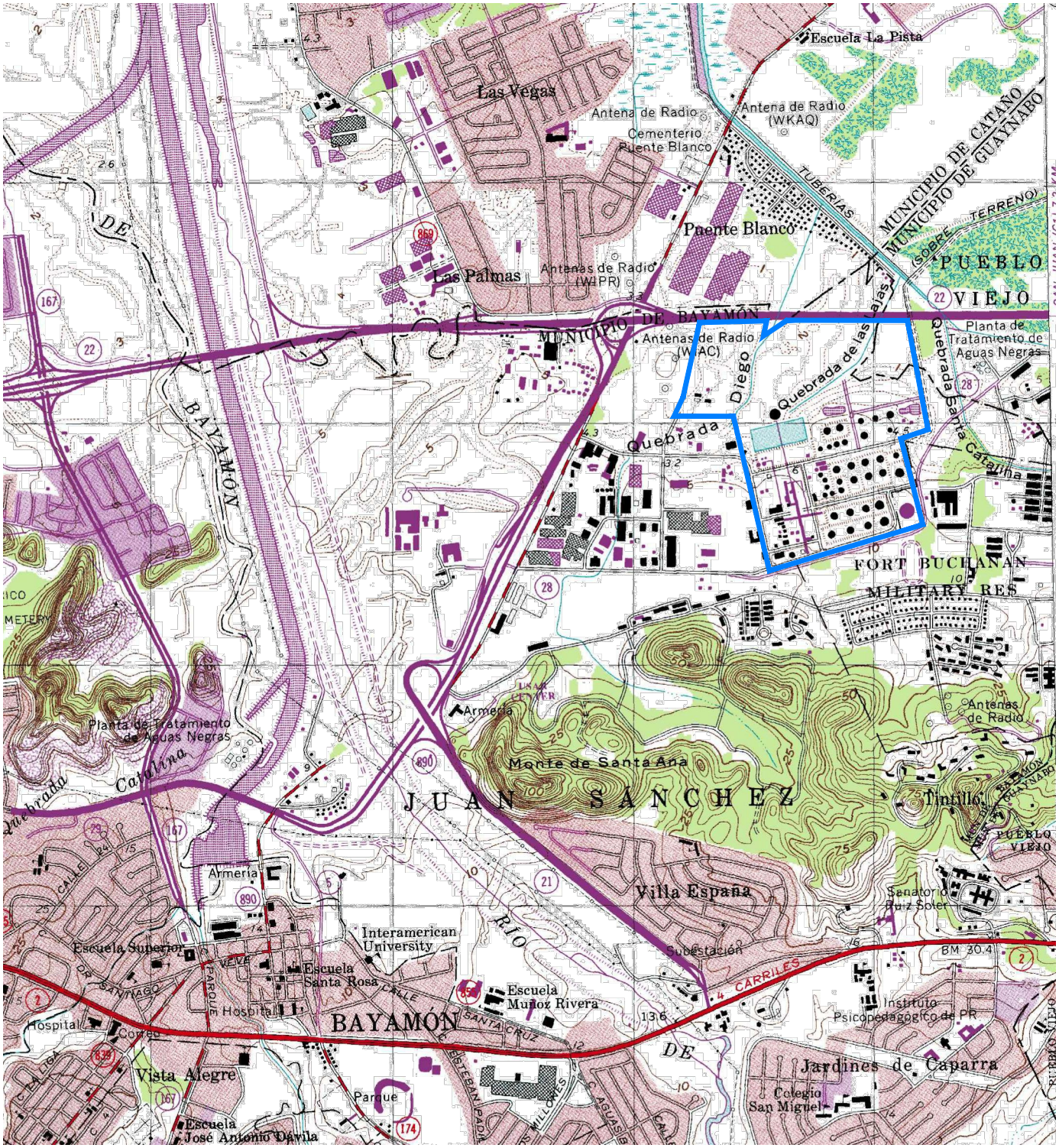
USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0). ERDC/EL TR-10-16. August 2010. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

USACE. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Caribbean Islands Region (Version 2.0). ERDC/EL TR-11-4. May 2001. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

United States Department of Agriculture. 2008. Custom Soil Resource Report for San Juan Area, Puerto Rico. Digital download: October 14, 2011. Natural Resource Conservation Service Web Soil Survey. URL: http://websoilsurvey.nrcs.usda.gov.

United States Department of Agriculture. 2011. Digital download: October 20, 2011. Natural Resource Conservation Service Web Plants Database. URL: http://plants.usda.gov/java/.

Uranowski, C., Lin, Z., DelCharco, M., Huegel, C., Garcia, J., Bartsch, I., Flannery, M. S., Miller, S. J., Bacheler, J. and Ainslie, W. January 2003. A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Low-Gradient, Backwater Riverine Wetlands in Peninsular Florida. Technical Report ERDC/EL TR-03-3. U.S. Army Engineer Research and Development Center, Vicksburg, MS.



SOURCE:
USGS TOPOGRAPHIC QUADRANGLE
BAYAMON, P.R., PHOTO REVISED 1982, 7.5 MINUTE SERIES
CONTOUR INTERVAL 5 METERS

0 2000' 4000'
GRAPHIC SCALE

LEGEND:

APPROXIMATE SITE BOUNDARY

AREA LOCATION

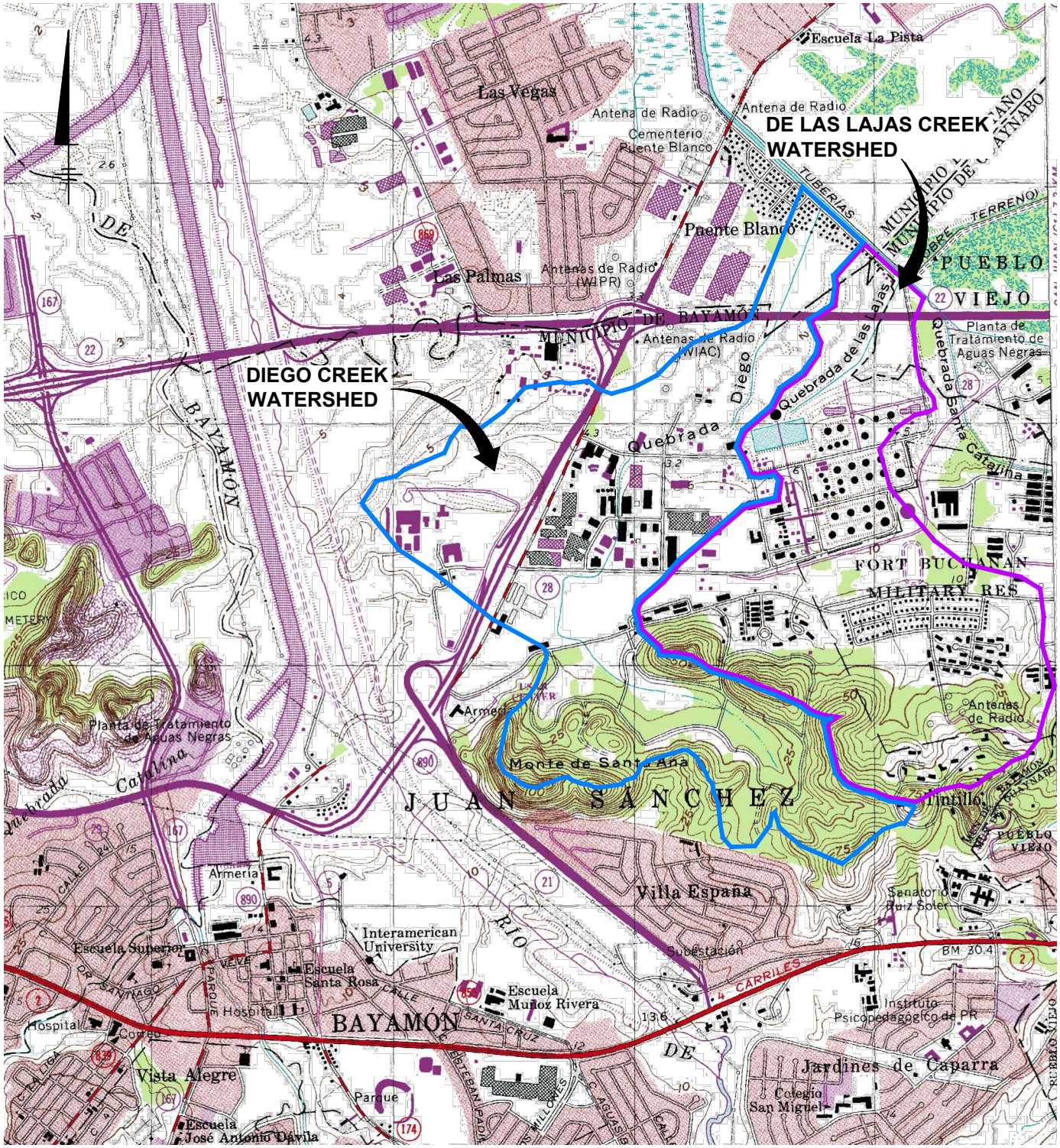
FORMER CARIBBEAN PETROLEUM CORPORATION REFINERY/ TERMINAL
BAYAMON, PUERTO RICO

HYDROGEOMORPHIC FUNCTIONAL ASSESSMENT REPORT

SITE LOCATION MAP

ARCADIS

FIGURE
1



SOURCE:

USGS TOPOGRAPHIC QUADRANGLE
7.5 MINUTE SERIES – BAYAMON, P.R.
CONTOUR INTERVAL 5 METERS

LEGEND:

DIEGO CREEK WATERSHED BOUNDARY

DE LAS LAJAS CREEK WATERSHED BOUNDARY

AREA LOCATION

PUERTO RICO

0 2000' 4000'

GRAPHIC SCALE

FORMER CARIBBEAN PETROLEUM CORPORATION REFINERY/ TERMINAL
BAYAMON, PUERTO RICO

HYDROGEOMORPHIC FUNCTIONAL ASSESSMENT REPORT

STUDY AND REFERENCE WETLAND WATERSHEDS

ARCADIS

FIGURE
2

CITY:CRANBURY-NJ DIV/GROUP: ENVCAD DB: JMEYER LD:JMEYER PIC:J.ALONSO PM:E.CALDERON TM:E.CALDERON LYR: ON=*;OFF=*REF*
C:\ENVCAD\CRANBURY\ACTIB00457091000003014570 9N01.DWG LAYOUT: 2 SAVED: 10/28/2011 1:27 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/28/2011 1:28 PM BY: FATTO, TRACEY
XREFS: IMAGES: PROJECTNAME: ---
45709X01.PDF

CITY: LAKEWOOD, CO DIV/GROUP: DB: M. MALLO PM: G. MARKIEWICZ
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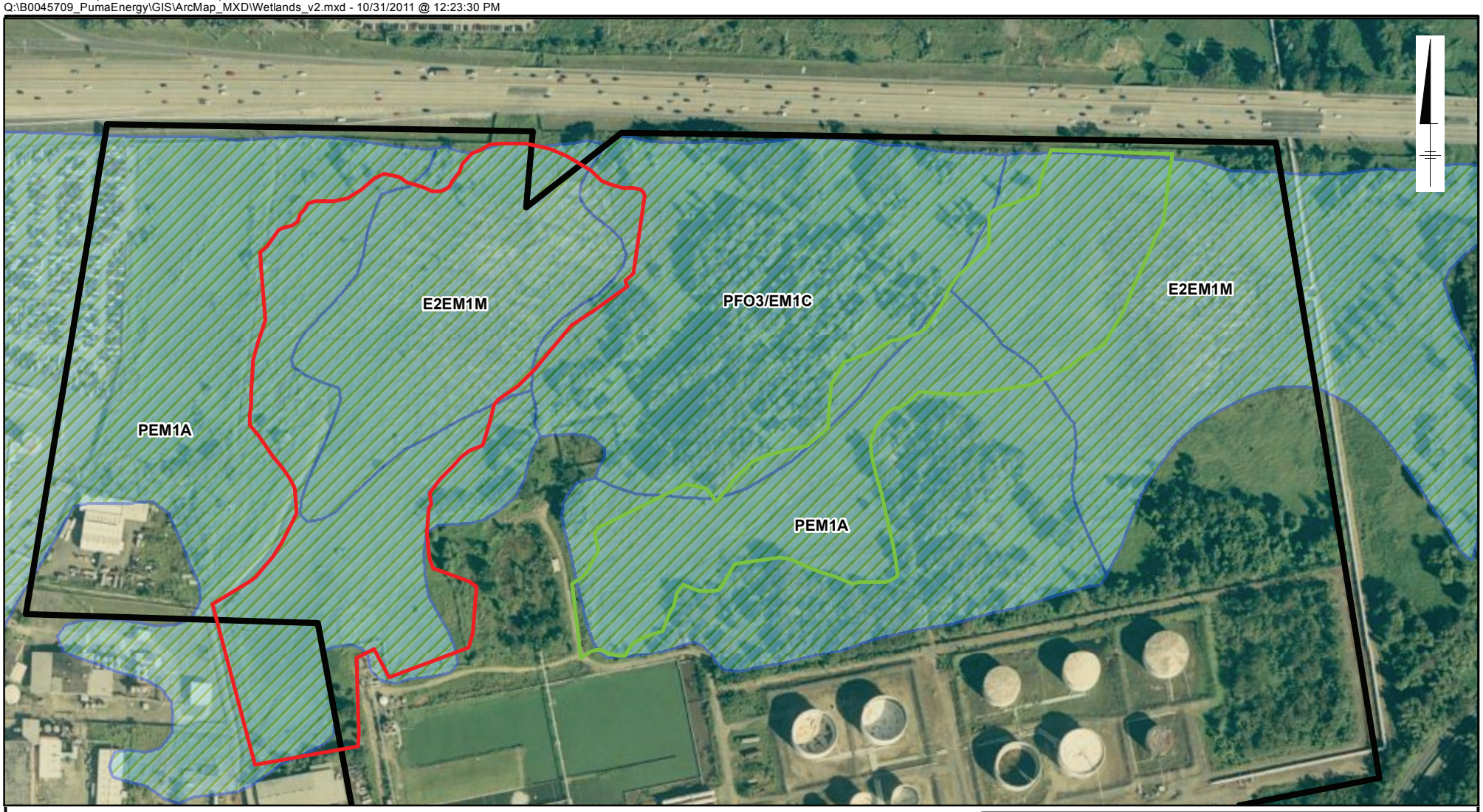

LEGEND

- APPROXIMATE SITE BOUNDARY
- NWI WETLANDS
- APPROXIMATE REFERENCE WETLAND BOUNDARY
- APPROXIMATE STUDY WETLAND BOUNDARY

0 175 350 700 Feet

NOTES:
E2EM1M - EMERGENT PERSISTENT SALTWATER TIDAL IRREGULARLY EXPOSED (ESTUARINE AND MARINE WETLAND)
PEM1A - PALUSTRINE EMERGENT PERSISTENT TEMPORARILY FLOODED (FRESHWATER EMERGENT WETLAND)
PF03/EM1C - PALUSTRINE FORESTED BROAD-LEAVED EVERGREEN/EMERGENT PERSISTENT SEASONALLY FLOODED (FRESHWATER FORESTED/SHRUB WETLAND)

FORMER CARIBBEAN PETROLEUM CORPORATION REFINERY/TERMINAL
BAYAMON, PUERTO RICO

HYDROGEOMORPHIC FUNCTIONAL ASSESSMENT REPORT

NATIONAL WETLANDS INVENTORY MAP

ARCADIS

FIGURE 3

ARCADIS PUERTO RICO

Appendix A

Key Personnel

ARCADIS

Education

PhD/Zoology, Rutgers University, 1975

MA/Environmental Education, Glassboro State College, 1970

BS/Biology, Lenoir-Rhyne College, 1965

Years of Experience

Total - 39

With ARCADIS - 10

Professional Registrations

Ecological Society of America, Senior Ecologist

Society of Wetland Scientists-Professional Wetland Scientist

Professional Qualifications

- Association of State Wetland Managers
- Ecological Society of America
- Estuarine Research Federation
- New Jersey Wildlife Society
- Society of Ecological Restoration
- Society of Wetland Scientists

Advisory Boards

- Public Service Electric and Gas, Estuarine Enhancement Management Plan Advisory Committee
- American Wetland Research Foundation, Inc.

Joseph K. Shisler, PhD, PWS, CSE

Principal Scientist

A nationally recognized wetlands expert, Dr. Shisler has more than 35 years of experience conducting wetland evaluations and restoration projects. He was former president of Shisler Environmental Consultants, Inc. in Little Egg Harbor, New Jersey. Before that he was at Rutgers University for more than 15 years, where he directed research on wetlands, wildlife use, stormwater management, wetland mitigation, and coastal zone management issues. Dr. Shisler has been a consultant to various state, federal, and international agencies concerning wetlands and stormwater management issues, and he has published more than 125 papers. His work was recognized by the New Jersey Wildlife Society, which presented him with the 1980 Conservationist of the Year award. Dr. Shisler performed an extensive wetland evaluation on Staten Island for the New York Department of Environmental Conservation. Governor Kean appointed him chairperson of the New Jersey Wetlands Mitigation Council in 1989 where he served for 9 years. He has been a wetland restoration consultant for 20 years to the 10,000 acre PSE&G Estuarine Enhancement Program for the Delaware Bay. Dr. Shisler is a professional wetland scientist certified by the Society of Wetland Scientists and a senior ecologist certified by the Ecological Society of America.

Experience

Environmental Consultant for Superfund Sites

Various Locations in U.S.

Environmental consultant on a number of Superfund sites throughout the United States to address wetland, wildlife, and natural resource damages. Interacted with agencies to obtain necessary permits and meet cleanup requirements that have included wetland delineation, wetland mitigation plans and successful implementation of the plans, and habitat and wildlife surveys.

Evaluation of Sites

New Jersey and Surrounding States

Evaluated more than 3,000 sites as potential wetland sites and environmental impacts for a number of engineering firms and assisted in obtaining the necessary permits required by the state and federal agencies.

Wetland Management Methods
While at Rutgers University, served as a consultant to New Jersey to address wetland management methods associated with mosquito control. Under his direction, the open marsh water management and tidal restoration of impoundments have become major methods in the restoration of coastal wetland ecosystems which are utilize in most states.

Wetland Mitigation
Over the last 30 years has a number wetland restoration and mitigation projects that have been implemented and determined to be successful have been located in NJ, PA, NY, CT, DE, FL, GA, MI and MS.

Expert Witness
Been qualified in several courts as an expert witness in various environmental fields including wetland delineations and management, wildlife management, ecology, stormwater management issues, environmental impact assessments, and pest management and accepted as an expert in more than 100 municipal and county planning boards and environmental commissions in New Jersey, Pennsylvania, and New York.

Faculty Member
Served as a faculty member at Rutgers University in the Department of Entomology and Economic Zoology and was an adjunct faculty member at the University of South Carolina and Trenton State College

Participant in Short Courses
Invited participant in a number of short courses for professionals for the USEPA; USCOE, the Office of Continuing Professional Education, Cook College - Rutgers University; The National Wetland Science Training Cooperative, Seattle, Washington; and Executive Enterprises, Washington, D.C. Instrumental in developing a short course series on wetlands and coastal issues at Rutgers University-Cook College. Has been invited participant in wetland mitigation, mosquito and vector control, dredge disposal issues, wildlife management, coastal zone development, and floodplain and stormwater management workshops (list available on request).

Overseas Consultant for Anti-malarial Project
Overseas consultant to the U.S. Department of State - Agency for International Development anti-malarial project in Zaire to address habitat management procedures and non-chemical methods in the control of vectors
Invited participant and chairperson of the Water and Weed Management, and Source Reduction Section for the Workshop “Comprehensive Vector Control - Current Status and Research Needs”

of the World Health Organization International Irrigation Management Institute Kandy, Sri Lanka-Environmental management for vector control

Evaluation of Mosquito Control Program
Evaluated the development of a comprehensive mosquito control program for Cape Cod National Park for the U.S. Department of Interior-Park Service

Consultant for Possible Lyme Disease Vectors
Mammal trapping and habitat identification consultant for possible Lyme disease vectors in New Jersey for the New Jersey Department of Health

Publications

Dr. Shisler has published more than 100 scientific papers in various periodicals and presented more than 200 scientific papers at various state, national, and international meetings (lists available on request). Papers have been published in following professional journals:

American Midland Naturalist
Biological Conservation
Bulletin of New Jersey Academy of Science
Bulletin of the Ecological Society of America
Condor
Ecological Restoration
Estuaries
Ibis
Human and Ecological Risk Assessment: An International Journal
J. of American Mosquito Control Association
J. of Medical Entomology
Marine Biology
Proc. of the Coastal Society
Proc. of Colonial Waterbird Group
Proc. of New Jersey Mosquito Control Association
Proc. of NE Fish and Wildlife
Science
Transactions of the American Fisheries Society
Wetlands
Wilson's Bulletin
Yale J. Biology and Medicine

ARCADIS

Education
BS/Natural Resource Management, Rutgers University, 2001

Years of Experience
With ARCADIS Since 2001

Professional Qualifications
Society for Ecological Restoration International
Society of Wetland Scientists
New Jersey Certified Pesticide Applicator: #54174B

Gary M. Markiewicz

Project Ecologist

Mr. Markiewicz has conducted wetland delineations, ecological evaluations and bio-monitoring, habitat restoration and enhancement, and biological and chemical sampling in various environmental media for over 9 years. He has extensive land use regulation experience including land use permit preparation, wetland mitigation design, and development and implementation of best management practices for threatened and endangered species. His responsibilities include mitigation and habitat restoration project design, implementation of habitat restoration projects and associated adaptive management, and field data collection activities, data interpretation, and report development.

Mr. Markiewicz has delineated wetlands for various sites in New Jersey, New York, Pennsylvania and Illinois using the U.S. Army Corp of Engineers (USACE) multi-parameter method for routine determinations and the respective supplemental manuals for the Atlantic and Gulf Coastal Plain, Northcentral and Northeast, Eastern Mountains and Piedmont, and Mid-West Regions. He has prepared and submitted numerous land use regulation permit applications for a variety of projects regulated by the Freshwater Wetlands Protection Act, the Coastal Area Facility Review Act, the Wetlands Act of 1970, the Waterfront Development Act and the Tidelands Act. Permit applications also addressed regulatory compliance with respect to flood hazard areas and riparian zones under jurisdiction of the Flood Hazard Area Control Act and areas regulated by the Delaware and Raritan Canal Commission. Mr. Markiewicz has also conducted numerous pre-application meetings with the New Jersey Division of Land Use Regulation (NJDLUR) for various remedial and utility infrastructure projects as well as other activities conducted in freshwater wetlands and other regulated areas.

Mr. Markiewicz also has a strong background in investigative field activities which includes vegetation community assessments, vernal pool monitoring, wildlife surveys, terrestrial and aquatic macro-invertebrate sampling, fish tissue collection and population studies, surface water sampling in riverine and wetland systems, and sediment and soil sampling in ecologically sensitive areas.

Mr. Markiewicz also has experience working in remote areas of Alaska performing fisheries activities associated with his work as a hatchery technician for the Prince William Sound Aquaculture Corporation (PWSAC).

Experience

Threatened and Endangered Species Best Management Practice (BMP) Development
Chatham and Ringwood, New Jersey (2007-present)
Engaged the United States Fish and Wildlife Endangered Species Program's New Jersey Field Office and New Jersey Division of Land Use Regulation Program to develop appropriate BMP protective of *Glyptemys {Clemmys} muhlenbergii* (bog turtle) and *Clemmys insculpta* (wood turtle), which allowed implementation of remedial activities at United States Environmental Protection Agency (USEPA) Superfund sites.

Wetland Delineation
Various Locations (2002-present)
Performed numerous wetland delineations for sites in New Jersey, New York, Pennsylvania and Illinois including, a 433-acre corporate campus, an 80-acre undeveloped property, approximately 50 miles of floodplain in state forest preserve land and residential properties, and a 144-acre Superfund site partially located in a United States Fish and Wildlife Service wildlife refuge. Delineations conducted in New Jersey were performed using the multi-parameter approach as outlined in the 1989 Inter Agency Federal Manual for Identifying and Delineating Jurisdictional Wetlands. Wetland delineations conducted outside of New Jersey were performed using the USACE multi-parameter method for routine determinations and the respective supplemental manuals for the Atlantic and Gulf Coastal Plain, Northcentral and Northeast, Eastern Mountains and Piedmont, and Mid-West Regions.

Land Use Permitting (Freshwater/Coastal Wetlands, Flood Hazard Area/Riparian Zone)
New Jersey (2001-present)
Prepared and submitted land use permit application packages to support remedial activities for numerous sites in New Jersey pursuant to the New Jersey Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A), New Jersey Coastal Zone Management and Coastal Permit Program Rules (N.J.A.C. 7:7 and 7:7E), New Jersey Flood Hazard Area Act Rules (N.J.A.C. 7:13), and the Delaware and Raritan Canal Commission (N.J.A.C. 7:45).

Land Use Permitting (Mitigation Plans)
New Jersey (2003-present)
Prepared and submitted numerous mitigation proposals as a component of freshwater wetlands general permits for remedial activities in accordance with N.J.A.C. 7:7A. Mitigation designs included creation and enhancement of emergent, wet-meadow, scrub/shrub, and forested wetland communities through broadcast application of native seed mixtures and planting of

native species. Designed monitoring and maintenance programs that incorporated adaptive management techniques to improve project success while reducing overall project costs.

Salt Marsh Vegetation Monitoring
Port Arthur, Texas (2008-present)
Perform vegetation monitoring in over100 acres of created salt marsh using quadrat sampling techniques to estimate percent cover of individual species.

Vernal Pool Monitoring
Central and Northern New Jersey (2007-present)
Conducted monitoring of potential and constructed vernal pool habitats at numerous sites in New Jersey. Activities included identification of plant, macro-invertebrate, reptile, and amphibian species and documentation of hydrology in accordance with the NJDFW Vernal Pool Data Form and NJDLUR Freshwater Wetlands Vernal Habitat Protocol.

Wildlife Inventories
Hopewell, New Jersey (2002-present)
Conduct routine wildlife inventories for a 433-acre corporate campus. Activities include identification and documentation of plant (tree, shrub, and herbaceous), mammalian, avian, and reptilian species. Prepare annual reports and present recommendations regarding wildlife and species diversity enhancement initiatives.

Comprehensive Ecological Evaluation
South Plainfield, New Jersey (2003-2009)
Assisted with the implementation of the evaluation of an organochlorine pesticide (OCP)-contaminated forested wetland system and unimpacted reference sites to assess the ecological function and value of the system when compared to reference sites. Activities included RBP surveys of vegetation; benthic and terrestrial invertebrate sampling; fish tissue collection using electro-fish shocking methods, and vernal pool monitoring.

Aquatic Bio-monitoring
Hopewell and Rockaway, New Jersey (2006-present)
Designed and conducted an aquatic bio-monitoring programs that included habitat assessment and benthic macroinvertebrate data collection and analysis based on rapid bioassessment protocols (RBP) developed by the United States Environmental Protection Agency (USEPA) and New Jersey Department of Environmental Protection (NJDEP) Bureau of Freshwater and Biological Monitoring. Activities included benthic macro-invertebrate sample collection, habitat assessment, data management and evaluation, and report preparation.

Fish Population and Tissue Sampling
Various Sites, New Jersey, New York, Michigan (2006-present)
Assisted with the implementation of fish population studies and tissue collection for several sites in New Jersey, New York, and Michigan using a variety of techniques including backpack electro-fishing units, boat-mounted electro-fishing rigs, gill nets, seine nets, etc.

Baseline Ecological Evaluation (BEE)
Various Sites, New Jersey (2002-2008)
Conducted BEE for several sites including a 5-acre industrial facility located in an urban area and an approximately 40-acre inactive industrial facility. Identified potential environmentally sensitive areas (ESA) and ecological receptors, identified potential contaminants of environmental concern (PCOEC), evaluated the potential for ecological effects from PCOEC based on potentially complete exposure pathways, and evaluated the need for further risk assessment based on the coincidence of ESA, PCOEC, and complete exposure pathways.

Ecological Characterization of Fringe Wetlands
Glenns Falls, New York (2005-2007)
Assisted with the design and implementation of fringe wetland characterization along approximately 20 miles of a major riverine system. Field activities included vegetation community delineation, plant community evaluation, and wildlife documentation to establish understanding of the functionality and composition of these systems for the planning and design of remedial and restoration activities.

Thermal Trend Study
New Jersey (1999)
As a member of the Rutgers Chapter of Trout Unlimited (RUTU), conducted a thermal trend study for the Muskenetcong and South Branch of the Raritan Rivers, in conjunction with the New Jersey Division of Fish and Wildlife (NJDFW). Activities included collection and analysis of field data recovered from in-situ thermal data loggers to identify thermal impacts to surface waters from point-source storm water discharges. Developed and presented recommendations for brook trout (*Salvelinus fontinalis*) population management practices based on study results to NJDFW.

Smolt Out-migration Population Survey
Paxson, Alaska (1998)
As a hatchery technician for PWSAC, conducted population surveys for out-migrating sockeye salmon (*Oncorhynchus nerka*) smolt. Activities included constructing sampling equipment, monitoring and collecting specimens from fish traps, tagging fish via wire code tagging machines, and recording fish count and size data.

Invasive Plant Species Control
Various Sites, New Jersey (2011-present)
Developed and implemented invasive species control programs for various plant community restoration and habitat enhancement projects in New Jersey using a variety of control methods including surgical spot application of herbicide to target invasive species (e.g., *Alliara petiolata*, *Phragmites australis*, *Polygonum cuspidatum*, *Rosa multiflora*) using backpack sprayers and wipe application, and strategic mowing.

Vernal Pool/Freshwater Wetlands/Upland Forest Mitigation Project
Ringwood, New Jersey (2008-present)
Designed and manage the restoration and enhancement of approximately 12 acres of freshwater wetlands on a Region 2 Superfund site as part of mitigation for remedial activities. The project involved the design and placement of bio- engineered techniques to stabilize and reduce erosion of steep slopes and the selection of plant species based on reference area vegetation assessments. Project goals included creation of emergent, wet-meadow, and scrub/shrub wetland communities and upland forest through broadcast application of native seed mixtures and planting of native species in areas previously disturbed by a remedial action. Vernal pool creation was incorporated into the project to increase ecological value while reducing costs associated with regrading and fill placement. Utilization of project provided habitat by numerous vernal pool dependent species and New Jersey listed threatened species was documented in 2009 and 2010, respectively.

Riparian Areas/Freshwater Wetlands Restoration and Enhancement Program
Hopewell, New Jersey (2002-present)
Design and manage riparian corridor and freshwater wetland system restoration and enhancement program on a 433-acre active pharmaceutical research and development facility. NJDLUR accepted managed areas for mitigation bank credits for implementation of the site's development plan.

Stream Restoration and Debris Removal
North Carolina (2006)
Managed restoration and debris removal for approximately 20 miles of trout production streams in northwest North Carolina impacted by seasonal hurricane activity. Field activities included oversight and management of three debris removal crews in remote areas of northwest North Carolina.

Freshwater Wetlands Mitigation Project
Caldwell, New Jersey (2005-2010)
Managed and implemented a freshwater wetlands mitigation project on a Region 2 Superfund site that created emergent, wet-meadow, and scrub/shrub wetland communities through broadcast application of native seed mixtures and planting of native species in areas previously dominated by common reed (*Phragmites australis*). Following a 5-year adaptive amnagment program, NJDLUR approved project completion in 2010.

Wildlife Habitat Council (WHC) Applications
New Jersey and Connecticut (2004-2009)
Prepared WHC application packages in accordance with WHC's application requirements for several large corporate campuses in New Jersey and Connecticut. Coordinated and participated in site visits conducted by WHC biologists and served as a liaison between the client and WHC.

Wildlife Habitat Management Plan (WHMP)
New Jersey and Connecticut (2004-2007)
Prepared WHMP for several large corporate campuses to increase on-campus wildlife habitats using sustainable practices and increase employee wildlife habitat awareness. Activities included a qualitative habitat analysis for wildlife habitats present on campus; a wildlife inventory to document plant, mammalian, avian, and reptilian species; and to identify habitat use. Coordinated and conducted hands-on informational field sessions that included amateur birding, nesting box monitoring, plant identification, and restoration practices.

Restoration and Enhancement - Freshwater Wetlands/Stream Corridor
South Plainfield, New Jersey (2004-2008)
Performed restoration and enhancement of approximately 5 acres of freshwater wetlands and stream corridor following completion of remedial activities in a forested wetland system. Activities included construction oversight, planting activity management and implementation, monitoring and project evaluation, and monitoring report preparation.

Stream Restoration
Somerset, New Jersey (2000)
As a member of RUTU, in conjunction with NJDFW, participated in the restoration of 600 linear feet of stream bank along the Muskenetcong River using bio-engineering techniques to stabilize and reduce stream bank erosion.

Restoration - Riverfront Freshwater Tidal Wetlands/Riparian
Edison, New Jersey (2002)
Conducted restoration activities along 1,600 linear feet of riverfront on a closed landfill. Activities included implementation of planting and seeding, and installation of live stakes to incorporate native vegetation and increase wildlife utilization along the riverfront.

Migration Pathway Survey and Maintenance
Paxson, Alaska (1998)
Conducted field surveys of remote streams for obstructions to native salmon migratory routes for PWSAC. Activities included accessing remote streams on foot, recording stream conditions and identifying obstructions to migratory routes, and removing flow obstructions by hand.

Groundwater Sampling Investigations (Passive Diffusion Methods)
New Jersey and Maryland (2001-2005)
Performed field task management for groundwater sampling investigations at several sites using passive diffusion methods. Activities included site coordination, sample collection, sample management, and laboratory coordination.

Groundwater Sampling Investigation (Low-flow/3-volume Purge Methods)
New Jersey, New York, Pennsylvania, and Puerto Rico (2001-2004)
Performed field task management for groundwater sampling investigations at numerous sites throughout New Jersey, New York, and Pennsylvania using low-flow and 3-volume purge methods. Also performed field task management for a 3-volume purge groundwater sampling investigation at a United States Environmental Protection Agency Superfund site in Puerto Rico. Activities included site coordination and sample collection, sample management and laboratory coordination, and instrument calibration.

Sediment Pore-Water Investigation
Hackettestown, New Jersey (2003)
Performed investigation using passive diffusion samplers for the analysis of dissolved chromium and hexavalent chromium. Designed and constructed sample apparatus and collected samples.

Salmon Brood Stock Harvest
Paxson, Alaska (1998)
Harvested sockeye salmon brood stock from a remote river for PWSAC. Activities included harvesting brood stock, egg sterilization and fertilization, and incubator preparation.

Selected Publications

Markiewicz, G.M., J.K. Shisler, C. Tuttle, A. Hebert, J. McBurney. 2011. Ecological and Economic Benefits of Adaptive Management for Wetland Mitigation. Poster presented at the Society of Environmental Toxicology and Chemistry Hudson-Delaware and Chesapeake-Potomac Regional Chapter Joint Meeting, 27-28 April, Wilmington, Delaware.

Markiewicz, G.M., J.K. Shisler, K. Hallinger, E. Zimmerman, G. Albright, and B. Bussa. 2010. Not All Restoration Sites are Created Equal - Lessons Learned from Wetland Restoration Projects Associated with Environmental Cleanups in New Jersey. Poster presented at the Society for Ecological Restoration International Mid-Atlantic Chapter Annual Conference, 20 January, Rutgers University, New Brunswick, New Jersey.

Markiewicz, G.M., J.K. Shisler, G.J. Braun, D.J. Stout, M. Koza, R.M. Weiss, A.P. Lanterman. Teaching Through Doing – Riparian Restoration and Wildlife Enhancement Projects as Educational Tools. Paper presented at the Ecological Society of America 92nd Annual Meeting and the Society of Ecological Restoration International 18th International Conference, 5-10 August, San Jose McEnery Convention Center, San Jose, California.

Markiewicz, G.M., G.J. Braun, J.K. Shisler, D.J. Stout, M.B. Koza, R.M. Weiss, and A.P. Lanterman. 2006. Restoration of riparian buffers on a New Jersey corporate campus. In Proceedings of the American Water Resources Association 2006 Summer Specialty Conference, eds. M. Colosimo and D.F. Potts. Missoula, Montana.

Markiewicz, G.M., G.J. Braun, J.K. Shisler, D.J. Stout, M.B. Koza, R.M. Weiss, and A.P. Lanterman. 2006. Riparian buffer restoration on a corporate campus - A component of a watershed management approach. In Proceedings of the Mid-Atlantic Sections American Water Resources Association Stream Restoration and Protection in the Mid-Atlantic Region Conference. NJ School of Conservation, Montclair State University, Branchville, New Jersey.

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Appendix B

HGM Functional Assessment Datasheets

Quadrat I.D.						RQ1		RQ2		RQ3		RQ4		RQ5	
					Sample Time:	14:13		14:42		10:47		12:05		12:15	
					Northing:	18°25'17.6"		18°25'14.8"		18°25'14.0"		18°25'08.4"		18°25'09.0"	
				GPS coordinates (Degrees,minutes,seconds)	Easting:	066°08'04.9"		066°08'07.0"		066°08'07.7"		066°08'13.1"		066°08'11.4"	
Scientific Name	Common Name	Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count
Herbaceous (1m x 1m quadrats) - Cover Class															
Typha domingensis	southern cattail	herb	OBL	N	Y	2	6	2	4	2	4				
Vigna luteola	hairypod cowpea	vine	FAC	N	Y	2		2		1					
Paspalum millegrana	paja brava	herb	FACW	N	Y	3	30	2	20	3	23	2	14		
Ipomoea batatas	sweetpotato	vine	FACW	Y	N	2		2		3		5		3	
Commelina erecta	whitemouth dayflower	herb	FAC	N	Y	1	1			2	150	2	6		
Colocasia esculenta	coco yam	herb	OBL	Y	N							3	14		
Urochloa mutica	para grass	herb	FACW	Y	N									5	300

Cover Woody Vegetation (10 m from quadrat center)	% Cover				
	Q1	Q2	Q3	Q4	Q5
	0	0	0	0	0

Shrubs (3 m from quadrat center)		Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	Stem count				
						Q1	Q2	Q3	Q4	Q5
-	-	-	-	-	-	None	None	None	None	None

Trees (3 m from quadrat center)		Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	DBH				
						Q1	Q2	Q3	Q4	Q5
-	-	-	-	-	-	-	-	-	-	-

Woody Debris (3m from quadrat center)	
Quadrat	% cover
Q1	0
Q2	0
Q3	0
Q4	0
Q5	0

Daubenmire % Cover Classes:	
Range of Cover (%)	Class
1-5%	1
6-25%	2
26-50%	3
51-75%	4
76-95%	5
96-100	6

Notes:

Wildlife Observations	
Quadrat	Observations
Q1	
Q2	
Q3	
Q4	
Q5	

Quadrat I.D.	RQ1						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-12	-	-	-	-	-	-	fibric
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y	Depth (inches): 2.5						
Water Table Present? (Y/N) Y	Depth (inches): 0.0						
Saturation Present? (Y/N) Y	Depth (inches): 0.0			no mineral soil layer, just organic root mat			

Quadrat I.D.	RQ2						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-12	-	-	-	-	-	-	fibric
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y	Depth (inches): 8.0						
Water Table Present? (Y/N) Y	Depth (inches): 0.0						
Saturation Present? (Y/N) Y	Depth (inches): 0.0			no mineral soil layer, just organic root mat			

Quadrat I.D.	RQ3						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-12	-	-	-	-	-	-	fibric
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y	Depth (inches): 2.0						
Water Table Present? (Y/N) Y	Depth (inches): 0.0						
Saturation Present? (Y/N) Y	Depth (inches): 0.0			no mineral soil layer, just organic root mat			

Quadrat I.D.	RQ4						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-12	-	-	-	-	-	-	fibric
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y	Depth (inches): 0.0						
Water Table Present? (Y/N) Y	Depth (inches): 0.0						
Saturation Present? (Y/N) Y	Depth (inches): 0.0			no mineral soil layer, just organic root mat			

Quadrat I.D.	RQ5						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-2	-	-	-	-	-	-	fibric
2-6	10YR 4/1	95	10YR 3/6	5	C	M	silty clay
6-8	10YR 5/4	50	10YR 5/8	40	C	M	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N)	Depth (inches):						
Water Table Present? (Y/N)	Depth (inches):			no mineral soil layer, just organic root mat at 0-2 in.; a lot of			
Saturation Present? (Y/N)	Depth (inches):			pea gravel (10YR 8/4) throhgout profile; refusal at 8 in.			

Quadrat I.D.						Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10	
					Sample Time:	10:51		11:25		12:14		13;10		9:17		9:45		10:07		13:15		13:30		13:46	
					Northing:	18°25'20.1"		18°25'20.1"		18°25'18.8"		18°25'15.6"		18°25'10.7"		18°25'09.6"		18°25'10.0"		18°25'10.46"		18°25'11.1"		18°25'11.7"	
				GPS coordinates (Degrees,minutes,seconds)	Easting:	066°07'52.4"		066°07'53.9"		066°07'57.3"		066°07'59.7"		066°08'05.3"		066°08'04.9"		066°08'04.5"		066°08'03.2"		066°07'02.1"		066°08'01.5"	
Scientific Name	Common Name	Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count	% Cover	Stem Count
Herbaceous (1m x 1m quadrats) - Cover Class																									
Typha domingensis	southern cattail	herb	OBL	N	Y	3	5					1	15	3	15										
Paspalum millegrana	paja brava	herb	FACW	N	Y	3	30	3	20	4		1	10	2	10	1	1	1	3	3	325	1	4	1	2
Ipomoea batatas	sweetpotato	vine	FACW	Y	N	2		2		1				3		2		2		5		6		5	
Vigna luteola	hairypod cowpea	vine	FAC	N	Y	2		1						2								1		1	
Ludwigia octovalvis	Mexican primrose-willow	herb	OBL	N	Y							2	6											1	1
Polygonum hydropiperoides	swamp smartweed	herb	OBL	N	Y							1	1											2	3
Commelina erecta	whitemouth dayflower	herb	FAC	N	Y											5	1400	2	8			1	7	3	400
Colocasia esculenta	coco yam	herb	OBL	Y	N													4	30						
unknown	unknown herb	herb	-	-	-													2	2						
Mimosa pudica	shameplant	herb	FAC	N	Y																			2	

Cover Woody Vegetation (10 m from quadrat center)						% Cover																			
						Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10	
						0		0		5		5		0		0		0		0		0		0	
						Stem count																			
Shrubs (3 m from quadrat center)		Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10	
Mimosa pellita	lollipop mimosa	shrub	FACW	N	Y	0		0		3		2		0		0		0		0		0		0	
						DBH																			
Trees (3 m from quadrat center)		Growth Form	Indicator Status	Invasive/Non-native (Y/N)	Native Wetland Species (Y/N)	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10	
-	-	-	-	-	-	-		-		-		-		-		-		-		-		-	

Woody Debris (3m from quadrat center)	
Quadrat	% cover
Q1	0
Q2	0
Q3	0
Q4	0
Q5	0
Q6	0
Q7	0
Q8	0
Q9	0
Q10	0

Daubenmire % Cover Classes:	
Range of Cover (%)	Class
1-5%	1
6-25%	2
26-50%	3
51-75%	4
76-95%	5
96-100	6

Notes:

Wildlife Observations	
Quadrat	Observations
Q1	
Q2	
Q3	
Q4	pig frogs, small fish in areas of open water
Q5	peepers chorusing
Q6	
Q7	
Q8	
Q9	
Q10	

Quadrat I.D.	Q1						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-12	2.5YR 3/1	100	-	-	-	-	silt
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y		Depth (inches): 6					
Water Table Present? (Y/N) Y		Depth (inches): 0					
Saturation Present? (Y/N) Y		Depth (inches): 0		no mineral soil layer, just organic root mat			

Quadrat I.D.	Q2						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-4	10YR 2/1	100	-	-	-	-	silt
4-12	7.5YR 5/1	75	10YR 4/6	25	C	M	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y		Depth (inches): 4.5					
Water Table Present? (Y/N) Y		Depth (inches): 0					
Saturation Present? (Y/N) Y		Depth (inches): 0					

Quadrat I.D.	Q3						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-6	2.5YR 6/4	50	10YR 4/7	25	D	M	silty clay loam
			10YR 4/6	15	C	M	
			10YR 5/6	10	C	M	
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y		Depth (inches): 5.0					
Water Table Present? (Y/N) Y		Depth (inches): 0					
Saturation Present? (Y/N) Y		Depth (inches): 0		refusal at 6 in.			

Quadrat I.D.	Q4						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-0.5	Gley 1/2.5/N	100	-	-	-	-	silt
0.5-12	7.5YR 5/1	50	7.5YR 4/1	10	D	M	silty clay
			7.5YR 5/6	40	C	M	
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N)		Depth (inches):					
Water Table Present? (Y/N)		Depth (inches):					
Saturation Present? (Y/N)		Depth (inches):					

Quadrat I.D.	Q5						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-8	-	-	-	-	-	-	fibric
8-12	10YR 3/1	100	-	-	-	-	silty clay loam
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) Y		Depth (inches): 2.0					
Water Table Present? (Y/N) Y		Depth (inches): 0					
Saturation Present? (Y/N) Y		Depth (inches): 0		sulfur odor at 8-12 in.			

Quadrat I.D.	Q6						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-4.5	10YR 4/1	85	5YR 4/6	15	C	M/R	silty clay
4.5-12	10YR 4/2	80	5YR 4/6	20	C	M/R	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) N		Depth (inches): 0					
Water Table Present? (Y/N) Y		Depth (inches): 6.0					
Saturation Present? (Y/N) Y		Depth (inches): 0					

Quadrat I.D.	Q7						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-4.5	10YR 4/1	85	5YR 4/6	15	C	M/R	silty clay
4.5-12	10YR 4/2	90	5YR 4/6	10	C	M/R	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) N		Depth (inches): 0					
Water Table Present? (Y/N) Y		Depth (inches): 10.0					
Saturation Present? (Y/N) Y		Depth (inches): 0					

Quadrat I.D.	Q8						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-8	-	-	-	-	-	-	fibric
8-12	7.5YR 4/3	75	10YR 3/7	25	D	M	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) N		Depth (inches): 0					
Water Table Present? (Y/N) Y		Depth (inches): >12					
Saturation Present? (Y/N) Y		Depth (inches): 10					

Quadrat I.D.	Q9						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-2	7.5YR 3/1	90	7.5YR 3/4	10	C	M	silty clay
2-12	7.5YR 3/2	85	7.5YR 4/6	15	C	M/R	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) N		Depth (inches): 0					
Water Table Present? (Y/N) Y		Depth (inches): >12					
Saturation Present? (Y/N) Y		Depth (inches): >12					

Quadrat I.D.	Q10						
	Matrix		Redox Features				
Depth (in)	Color	%	Color	%	Type	Loc	Texture
0-3	5YR 3/2	100	-	-	-	-	silty clay
3-12	2.5YR 4/3	90	7.5YR 5/8	10	C	M	silty clay
Hydrology				**Additional Notes:**			
Surface Water Present? (Y/N) N		Depth (inches): 0					
Water Table Present? (Y/N) Y		Depth (inches): 9					
Saturation Present? (Y/N) Y		Depth (inches):2					

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Appendix E

Facility Photo Log
(September 30, 2011)

ARCADIS PUERTO RICO

Facility Photo Log

Current Conditions Report
Former Caribbean Petroleum
Refining Facility
Bayamón, Puerto Rico

Photograph 1 - View of the southern side of the facility (facing west)

Photograph 2 - View of the eastern side of the facility (facing south)

Photograph 3 - View of the eastern side of the Scrap Metal Storage Area #1 (facing northeast)

Photograph 4 - View of the western side of Scrap Metal Storage Area #1 (facing west)

Photograph 5 - View of the facility from the northeast corner (facing southwest)

Photograph 6 - View of the aeration basin and closed equalization basin (facing west)

Photograph 7 - View of Outfall 002 (facing north)

Photograph 8 - View of the storm water basin that flows to Outfall 002 (facing south)

Photograph 9 - View of Las Lajas Creek (facing east)

Photograph 10 - View of Las Lajas Creek (facing west)

ARCADIS PUERTO RICO

Appendix F

Documentation Related to Fort Buchanan Property

Fort Buchanan

Northwest Boundary Investigation

Fort Buchanan, Puerto Rico

1 August 2007

Site Background

- Caribbean Petroleum Refinery Company Property is conducting a RCRA Facility Investigation (RFI).
- Trichloroethylene (TCE) has been detected in groundwater samples collected as part of the RFI.
- EPA has requested that Fort Buchanan assess the extent of groundwater contamination along the northwest boundary of Fort Buchanan.
    - Areas of investigation include SWMU-3 and the DPW Complex

Purpose

- Investigate the extent of groundwater contamination within the northwest boundary of Fort Buchanan.

Investigation Activities Conducted to Date

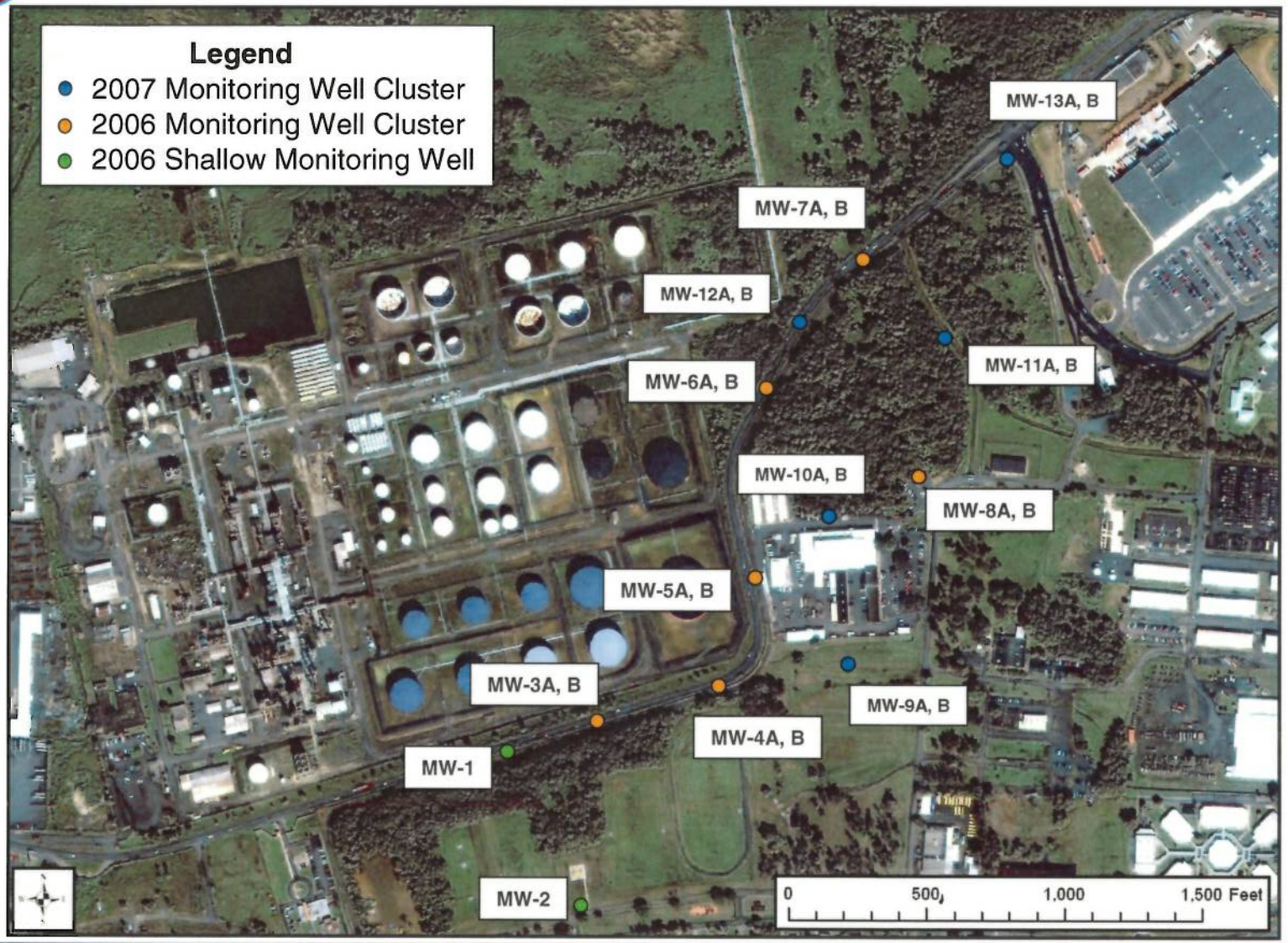
PHASE I (Oct 06 – Jan 07)

- Installation of 14 monitoring wells, including 6 monitoring well clusters and 2 individual wells.
- Deep soil borings at two locations.
- Groundwater sampling event – January 2007.

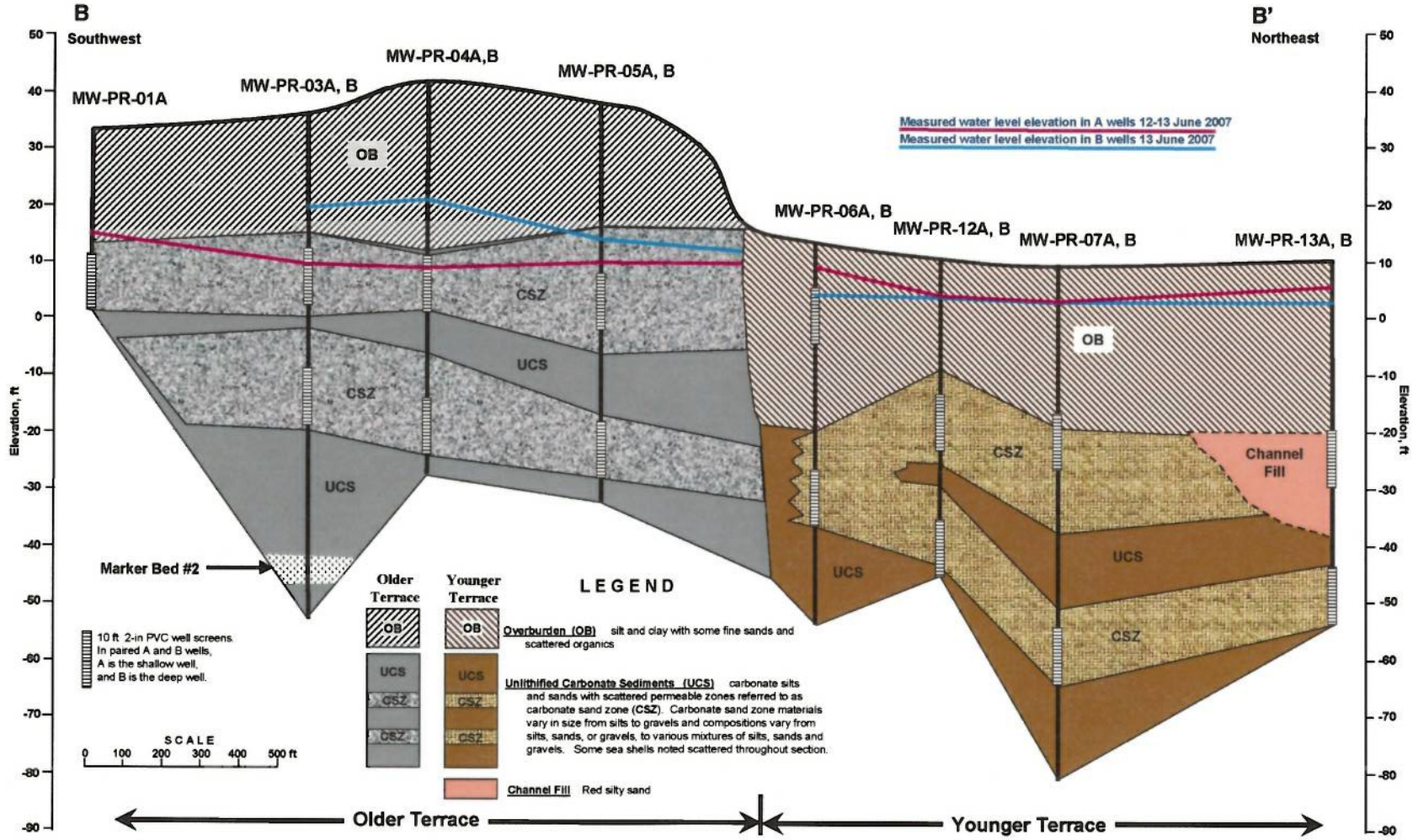
PHASE II (May-June 2007)

- Installation of 10 additional monitoring wells
- Groundwater sampling event – June 2007.

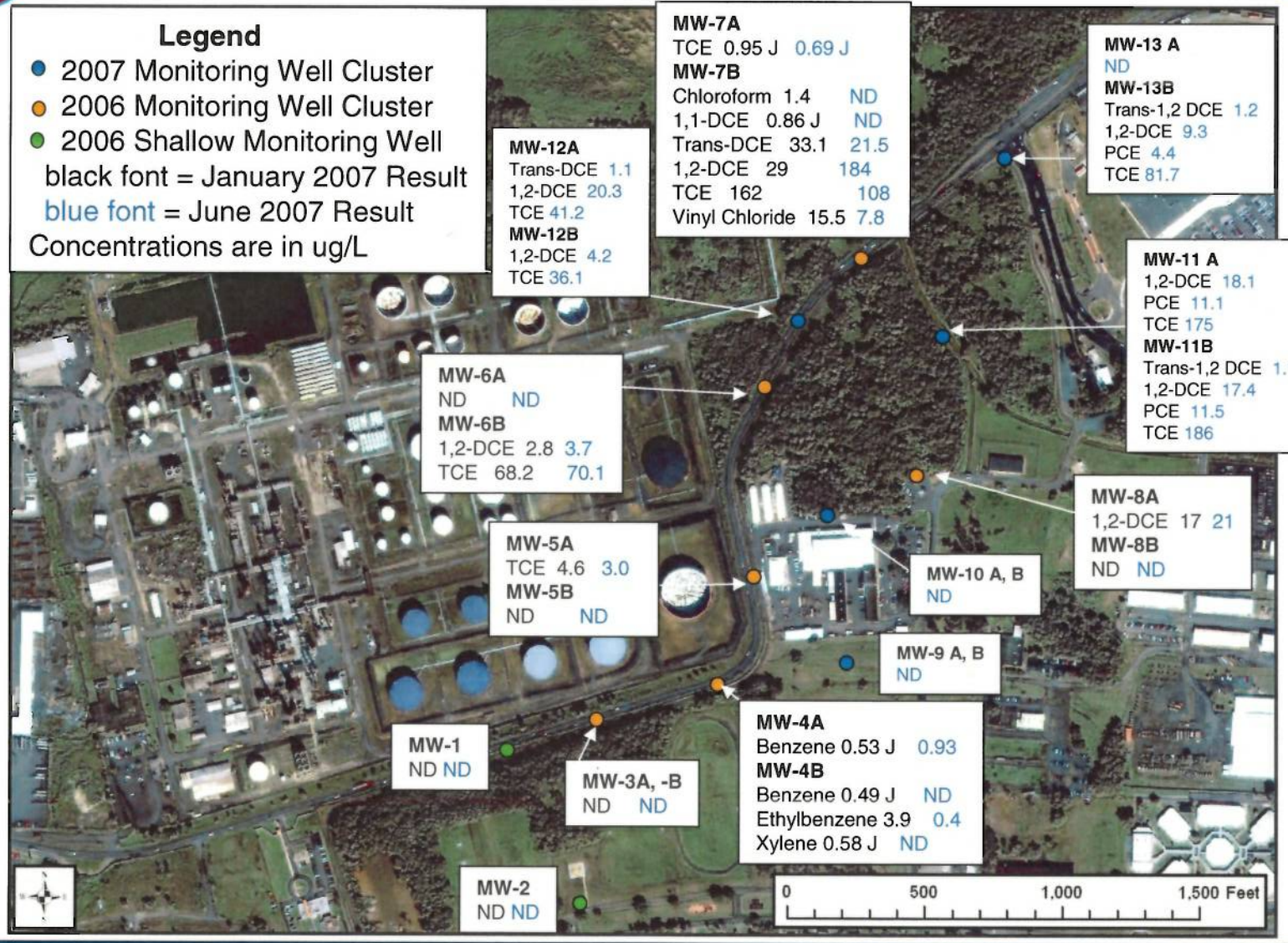
Monitoring Well Locations



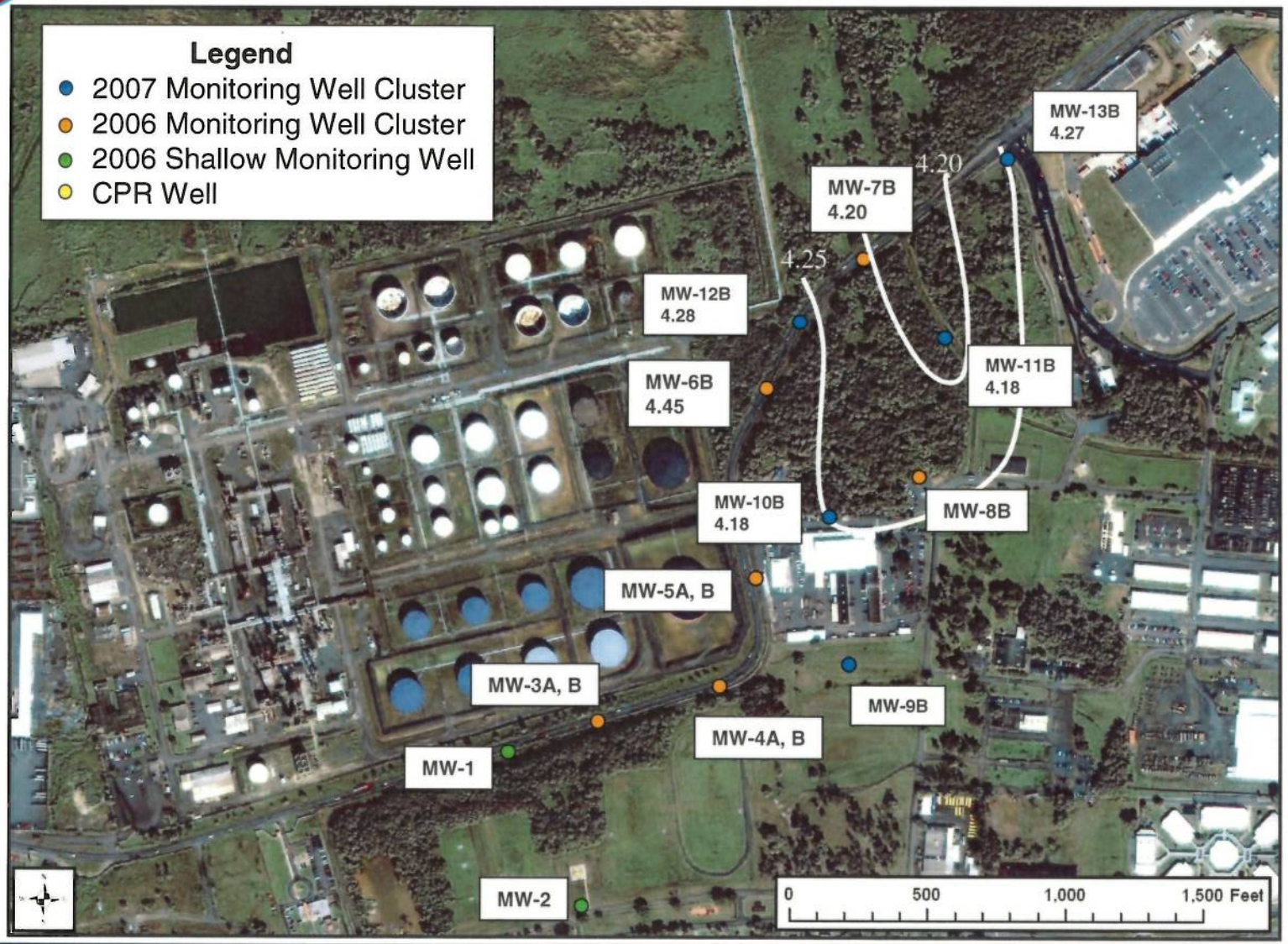
Cross Section – Along Perimeter Road



VOC Concentrations (Detections Only)
January and June 2007



Groundwater Elevations
(Within Carbonate Sands)



Conclusions

- SWMU 3: Pesticides and Chemicals Burial Trench is not the source of the TCE contamination in groundwater.

- The groundwater gradient is steepest to the south and relatively flat to the north.

- Groundwater generally flows to the north-northwest offpost.

- Pesticides and herbicides were not detected in groundwater.

- TCE is the main chemical of potential concern in groundwater.

- Source of TCE contamination remains undefined.

Recommendations

- Additional delineation of potential sources to the south-southeast of the DPW complex.

Proposed Areas of Additional Sampling

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Ft. Buchanan Pass-through Oil Release - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region II

Subject: **POLREP #16**
SPECIAL #6: Significant Discharge of Oil/Grease into Ft. Buchanan
Ft. Buchanan Pass-through Oil Release
Z2AQ
Guaynabo, PR
Latitude: 18.4202546 Longitude: -66.1165810

To: Anibal Negron, US Army (civilian)
Francisco Mendez, US Army (civilian)
Hector Ortiz, USEPA-CEPD
Sonia Cosme, EDS Inc.
Ada Bones Berrios, Municipality of Guaynabo

From: Paul L. Kahn, OSC
Date: 6/30/2011
Reporting Period:

1. Introduction

1.1 Background

Site Number:	Z2Q	**Contract Number:**	EP-S2-10-01
D.O. Number:	027	**Action Memo Date:**	
Response Authority:	OPA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	2/4/2011	**Start Date:**	2/4/2011
Demob Date:	2/15/2011	**Completion Date:**	
CERCLIS ID:		**RCRIS ID:**	
ERNS No.:		**State Notification:**	
FPN#:	E11201	**Reimbursable Account #:**	

1.1.1 Incident Category

There is an on-going release of oil, a viscous oil-like substance, and chemical wastes into a storm water line which leads to an outfall on Ft. Buchanan, PR, an active Army military base. The outfall creates a stream that flows to a wetlands, then to Mosquito Creek which passes through the town of Puenta Blanco. From there the creek empties into San Juan Bay west of Cataño. There is a significant threat that this discharge will enter the San Juan Bay, a navigable waterway of the United States.

1.1.2 Site Description

The Site is located on an active US Army military base.

1.1.2.1 Location

The Site is located on the north side of the base approx. 200 yards from Expressway 52.

1.1.2.2 Description of Threat

The threat is a heavy oil sheen, globs of semi-solid, viscous grease-like substance, and organic chemicals being discharged into navigable waters of the US.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

On April 14, 2011 EPA and its contractor used a remote operated pipe crawler to view the interior of the storm water pipe. Due to a large obstruction in the center of the pipe the crawler was only able to get 300 feet into the pipe. However, during that short distance it can be seen that there are 3 smaller pipes that join the main pipe, and within the 300 feet there are at least 4 areas where water is visibly infiltrating the main pipe, seemingly at the pipe section joints.

On June 14, 2011 EPA OSC inspected a meat processing company in an industrial park and believes the source of the oil/grease has been located.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

This POLREP will serve to report that on June 29, 2011 staff of the civilian Environmental Department at the Fort reported to the EPA OSC that a large discharge of an oily, grease-like material came from the outfall. Photos of the discharge (attached) accompanied the report. The report included the observation that the material smelled like burnt cooking oil. Environmental staff responded to the discharge and deployed boom/spill pads that EPA had provided.

On 6/30/11 Environmental staff sent the OSC 3 additional photos of the aftermath of the discharge (see Images section) along with a narrative description of the material. The OSC was advised that the material smelled like meat and meat seasoning (spices) and looked "like the stuff from Marvel".

The OSC then contacted EDS Inc., consultants for the Municipality of Guaynabo, and asked if they could acquire samples of the material and bring them to a local licensed analytical lab. EDS agreed to acquire samples and transport them to the lab.

EPA contractor, Kemron Inc., contacted the lab and made arrangements for the lab to accept the samples, log them in, and test them for oil, grease and red blood cells.

2.1.2 Response Actions to Date

At the request of the Base Commander, Col. J. Cushman, EPA agreed to address the release. The OSC has opened a spill account for $50,000 from the National Pollution Funds Center. The OSC activated the Region II ERRS contractor (already on-site at an adjacent Superfund site) and the contractor was mobilized to the Site. The contractor deployed fresh boom at three locations then removed the two strings of boom that the PREQB had deployed.

A check of the booms on 2/6/2011 revealed that it was capturing sheen and product at all three areas where it was deployed.

OSC Mark Gallo checked on boom status from 2/14 through 2/23, replacing it on 5 occasions. OSC Gallo reports that there is an oil and grease material is being discharged along with a heavy sheen.

Sample taken on 2/7/2011 was analyzed and found to contain primarily an oil/grease.

On 2/22/11 base civilian personnel agreed to EPA installing an underflow dam at the outfall. OSC gave its ERRS contractor the green light to begin preparations for mobilizing a crew to the Site on 3/7/11 to

begin construction of the dam.

On 2/23/2011 the ERRS contractor reports that clumps of a grey-brown oily sludge was released from the outfall but was stopped and collected by the boom.

On 3/2/2011 verbal authorization for an additional $75,000 in mitigation funds was provided by the NPFC Case Officer to the OSC. This brings the total mitigation ceiling for this response to $125,000.

Analytical results received for the 3-phase sample taken on 2/16/2011. OSC is reviewing data to try to connect the chemicals to operational facilities in the Amelia Industrial Park. OSC has forwarded an electronic copy of the analytical results to the Environmental Office at Ft. Buchanan.

ERRS began the installation of the underflow dam by clearing brush from the sides of the stream and excavating soil to prepare an area to lay sandbags.

ERRS completed the installation of the underflow dam on 3/12/2011 with the application of the remaining rip-rap and silt fence.

On 4/14/2011 EPA used a small, motorized, remote camera device to view the interior of the storm water pipe. The device traveled 300 feet into the pipe and located one, possibly two, breaks in the pipe where water was infiltrating. The device was prevented from moving further up the pipe by a large, unidentified obstruction in the center of the pipe.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

HISTORICALLY: The release is discharged from a storm water outfall on the property of Ft. Buchanan. The storm water system is owned and operated by the Municipality of Guaynabo. Directly upstream from the fort is the Amelia Industrial Park, an expansive collection of dozens of businesses. The storm sewer system flows through the industrial park into the Base where it is discharged and creates a stream.

EPA has discovered that there are CERCLA chemicals in the storm water in addition to petroleum that is causing a sheen and visible globs of oil.

EPA used remote pipe crawler to located places inside main storm water pipe where liquid is infiltrating the pipe.

The USCG Case Officer has advised the OSC to not close-out the OPA portion of this Site, and consequently it will remain an active OPA federal project.

On April 15, 2011, EPA and its ERRS contractor met with reps from the Guaynabo DPW to discuss the FENs that were issued to the Municipality and to discuss what was seen from the pipe crawler. Municipal officials agreed to cooperate fully with EPA to attempt to discover the source of the chemicals and oil in the storm water system and also to locate/correct leaks into their system.

Between April 18th and april 29th DPW officials and their consultants have located a number of areas where infiltration is occurring and have also identified a potential industrial discharge into their storm water system. DPW officials are preparing a progress report to EPA which will detail and summarize their efforts since the April 14th meeting.

Digital photos of the remote pipe crawler can be seen in the "Images" section.

CURRENT: The Municipality of Guaynabo is in the process of drafting ordinances to address the matter of illicit discharges into its storm water system.

EPA believes it has identified a major contributor to the discharge of sheen, grease/fat appearing at the Ft. Buchanan outfall

2.1.4 Progress Metrics

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal

soiled/oiled boom	solid	20 cu. yds.	12047	none	landfill

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

2.2.1.2 Next Steps

EPA will await the results of the most recent round of sampling and will respond accordingly. If there is a repeat of of this incident the OSC and the EPA contractor will deploy to the Site and reinspect Marvel and every company that is in proximity to the storm drain line that connects Marvel to the outfall at Ft. Buchanan.

2.2.2 Issues

2.3 Logistics Section

No information available at this time.

2.4 Finance Section

No information available at this time.

2.5 Other Command Staff

No information available at this time.

3. Participating Entities

No information available at this time.

4. Personnel On Site

No information available at this time.

5. Definition of Terms

No information available at this time.

6. Additional sources of information

No information available at this time.

7. Situational Reference Materials

No information available at this time.

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Ft. Buchanan Pass-through Oil Release - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region II

Subject: **POLREP #16**
SPECIAL #6: Significant Discharge of Oil/Grease into Ft. Buchanan
Ft. Buchanan Pass-through Oil Release
Z2AQ
Guaynabo, PR
Latitude: 18.4202546 Longitude: -66.1165810

To: Anibal Negron, US Army (civilian)
Francisco Mendez, US Army (civilian)
Hector Ortiz, USEPA-CEPD
Sonia Cosme, EDS Inc.
Ada Bones Berrios, Municipality of Guaynabo

From: Paul L. Kahn, OSC
Date: 6/30/2011
Reporting Period:

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2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

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2.2.2 Issues

2.3 Logistics Section

No information available at this time.

2.4 Finance Section

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3. Participating Entities

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5. Definition of Terms

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6. Additional sources of information

No information available at this time.

7. Situational Reference Materials

No information available at this time.

OSC On-Scene Coordinator

United States Environmental Protection Agency EPA

Login

Ft. Buchanan Pass-through Oil Release

Guaynabo, PR - EPA Region II

POLREP #16 - SPECIAL #6: Significant Discharge of Oil/Grease into Ft. Buchanan

Description: Response by Ft. Buchanan personnel to release that occurred on 6/29/11. View looking south at outfall.
Date Taken: 6/30/2011
Security Level: Public
Category: Site Photo
Latitude:
Longitude:
Tags: POLREP15546

<- ->

Response by Ft. Buchanan personnel to re...

View of 6/29/11 discharge at outfall, vi...

Discharge of oil/grease into outfall on ...

Close

ARCADIS PUERTO RICO

Appendix G

2004 Groundwater Monitoring Report
Tables and Figures

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Date September 17, 2003

Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
Zone A Wells (Overburden)						
4A	9:25	6.56	--	--	16.18	9.62
13A	8:25	6.09	--	--	17.76	11.67
15A	8:23	4.78	--	--	10.62	5.84
16A	9:01	2.96	--	--	10.66	7.70
22A	10:37	5.04	--	--	16.97	11.93
23A	9:36	7.62	--	--	17.97	10.35
25A	9:10	7.29	7.29	Sheen	17.69	10.40
26A	9:32	5.88	--	--	16.23	10.35
27A	9:15	4.34	4.28	0.06	18.52	14.23
29A	10:25	5.76	5.76	Sheen	16.24	10.48
30A	9:10	5.82	--	--	15.59	9.77
30A2	10:08	7.37	--	--	17.36	9.99
31A	10:01	4.62	4.32	0.30	16.45	12.07
33A	8:12	5.70	--	--	18.07	12.37
35A	11:15	4.60	--	--	13.91	9.31
36A	11:25	4.93	--	--	15.10	10.17
37A	12:48	7.85	--	--	16.67	8.82
38A	12:38	7.54	--	--	17.50	9.96
39A	10:42	11.84	11.78	0.06	21.42	9.63
41A	10:50	8.82	--	--	21.75	12.93
46A	9:45	6.22	--	--	18.28	12.06
47A	10:29	4.87	4.84	0.03	15.04	10.19
54A	9:11	5.12	--	--	13.27	8.15
56A	8:24	11.23	11.23	Sheen	22.62	11.39
57A	8:04	5.06	--	--	19.65	14.59
59A	7:55	3.12	--	--	15.21	12.09
60A	7:50	3.10	3.10	Sheen	14.54	11.44
61A	7:44	4.78	--	--	14.74	9.96
63A	12:41	7.97	--	--	18.73	10.76
64A	8:13	9.11	--	--	19.52	10.41
65A	11:13	6.36	--	--	15.84	9.48
66A	9:16	6.08	--	--	16.57	10.49
67A	9:21	6.98	--	--	17.63	10.65
68A	9:28	7.58	--	--	17.82	10.24
69A	9:39	7.95	--	--	18.76	10.81

Date: September 17, 2003

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
70A	10:19	6.45	6.45	Sheen	17.75	11.30
71A	10:47	4.34	--	--	17.55	13.21
72A	10:38	4.97	--	--	18.66	13.69
76A	7:55	6.98	--	--	13.89	6.91
82A	8:39	12.17	--	--	17.30	5.13
83A	9:22	5.72	--	--	11.77	6.05
84A	8:34	6.47	--	--	10.23	3.76
85A	8:42	7.20	--	--	16.92	9.72
86A	11:49	6.19	--	--	11.53	5.34
87A	10:10	11.31	--	--	27.58	16.27
88A	10:20	13.34	--	--	24.97	11.63
89A	10:23	6.18	--	--	25.77	19.59
90A	10:27	9.39	--	--	24.01	14.62
91A	10:29	7.27	--	--	22.70	15.43
92A	11:39	4.80	--	--	13.02	8.22
93A	10:08	6.27	--	--	18.73	12.46
94A	10:24	5.16	--	--	18.77	13.61
95A	10:29	14.17	--	--	28.36	14.19
96A	11:36	5.84	--	--	17.80	11.96
97A	11:33	7.00	--	--	20.31	13.31
COB	9:05	8.20	--	--	18.28	10.08
P1	9:47	6.67	6.67	Sheen	15.43	8.76
P5	9:06	5.81	--	--	16.26	10.45
PZ1	10.06	7.24	--	--	19.22	11.98
B-1	8:18	3.30	--	--	14.45	11.15
B-2	9:42	7.06	--	--	15.66	8.60
B-3	8:24	5.55	--	--	16.15	10.60
B-4	11:08	5.11	5.11	Sheen	17.22	12.11
B-5	9:44	6.14	--	--	19.04	12.90
B-6	8:58	2.70	--	--	16.06	13.36
B-7	9:14	6.91	--	--	16.38	9.47
B-8	11:04	6.42	6.39	0.03	16.03	9.63
B-9	8:16	3.74	--	--	14.96	11.22
B-10	9:08	5.96	--	--	14.76	8.80
B-11	11:28	7.67	7.67	Sheen	15.04	7.37
B-12	8:32	4.81	--	--	14.89	10.08
B-13	11:30	7.52	7.50	0.02	14.87	7.37

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Date: September 17, 2003

Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
B-14	8:29	3.08	--	--	11.65	8.57
B-15	8:47	3.50	--	--	11.66	8.16
B-16	8:44	3.86	--	--	12.13	8.27
B-17	8:22	6.53	--	--	16.06	9.53
B-18	8:24	5.81	--	--	15.34	9.53
B-19	11:39	3.69	3.69	Sheen	11.78	8.09
B-20	11:33	4.19	4.17	0.02	12.18	8.01
B-21	8:42	6.65	--	--	14.28	7.63
B-22	12:53	ND	7.82	ND	16.87	ND
B-23	8:56	8.67	--	--	18.54	9.87
B-24	9:00	7.97	--	--	19.10	11.13
B-25	9:19	6.15	--	--	18.86	12.71
B-26	9:28	7.34	--	--	18.45	11.11
B-27	9:25	7.30	--	--	16.99	9.69
I-1	11:19	6.69	6.64	0.05	16.80	10.15
I-2	11:15	7.79	7.19	0.60	14.57	7.27
I-3	11:17	6.47	6.43	0.04	16.80	10.36
I-4	11:01	7.60	7.50	0.10	17.68	10.16
I-6	9:21	5.85	--	--	16.61	10.76
I-9	11:20	6.92	6.69	0.23	16.58	9.85
I-10	10:59	7.32	7.27	0.05	17.63	10.35
EB-101	8:14	5.57	--	--	14.07	8.50
EB-102	8:04	8.35	--	--	14.66	6.31
EB-103	8:02	6.12	--	--	12.35	6.23
EB-104	8:06	7.49	--	--	13.52	6.03
EB-105	8:08	8.15	--	--	13.95	5.80
EB-106	8:11	7.99	--	--	13.45	5.46
EB-107	7:55	5.21	--	--	11.24	6.03
EB-108	7:58	5.45	--	--	11.70	6.25
MP-1	10:22	4.47	--	--	9.85	5.38
DP-1	10:24	3.67	--	--	9.04	5.37
MP-2	10:26	4.20	--	--	9.77	5.57
MP-3	10:30	3.92	--	--	9.19	5.27
MP-4	10:32	7.02	--	--	12.46	5.44
MP-5A	8:07	4.03	--	--	9.39	5.36
DP-5	10:44	3.10	--	--	8.84	5.74

Equalization Basin

Date: September 17, 2003

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
MP-6	10:55	3.94	--	--	8.91	4.97
MP-8	10:38	7.54	--	--	12.48	4.94
MP-9	10:39	5.40	--	--	10.00	4.60
MP-10	10:34	5.36	--	--	10.15	4.79
Zone B/B1 Wells (Carbonate Sediment)						
1AB	8:25	10.10	--	--	16.56	6.46
2AB	9:02	9.14	--	--	14.32	5.18
3AB	10:16	11.68	11.47	0.21	17.23	5.72
5AB	10:23	7.88	7.57	0.31	17.34	9.71
6AB	9:49	ND	10.88	ND	14.21	ND
7AB	9:14	11.84	11.84	Sheen	17.01	5.17
8AB	9:24	12.67	10.25	2.42	16.44	5.61
9AB	8:48	ND	11.67	ND	16.41	ND
12AB	9:18	12.32	12.08	0.24	17.52	5.38
13B	8:23	12.05	--	--	16.51	4.46
14AB	11:09	9.34	--	--	16.27	6.93
14B	11:10	11.16	--	--	16.31	5.15
15B	8:15	6.15	--	--	11.37	5.22
16B	8:59	5.53	--	--	10.98	5.45
16C	8:57	6.74	--	--	12.13	5.39
17B	7:47	3.79	--	--	9.36	5.57
18D	7:30	12.82	--	--	31.78	18.96
20B	12:36	4.07	--	--	9.06	4.99
21B	12:44	1.25	--	--	6.17	4.92
22B	10:35	9.68	--	--	18.09	8.41
23C	9:41	11.87	--	--	16.78	4.91
24AB	9:21	11.30	11.25	0.05	17.89	6.63
28AB	9:00	13.27	13.07	0.20	18.31	5.20
28B	8:15	13.06	--	--	18.26	5.20
30B	9:11	10.72	--	--	16.01	5.29
32AB	9:45	ND	10.97	ND	16.51	ND
34AB	8:35	16.21	16.00	0.21	20.88	4.84
34B	8:07	15.27	--	--	20.43	5.16
34C	8:08	15.39	--	--	19.31	3.92
36C	11:22	10.04	--	--	15.22	5.18
40B	10:40	13.12	12.49	0.63	19.62	7.04

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Date: September 17, 2003

Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
42B	10:35	24.28	24.28	Sheen	29.74	5.46
43B	10:38	21.25	21.15	0.10	27.13	5.96
44B	10:45	16.95	16.95	Sheen	22.96	6.01
45B	9:05	13.42	13.13	0.29	18.84	5.65
48B	ND	ND	ND	ND	16.72	ND
49B	8:33	15.18	--	--	20.38	5.20
50B	9:35	12.28	12.16	0.12	17.34	5.16
51B	9:59	11.47	11.38	0.09	16.69	5.29
52B	10:13	13.09	13.09	Sheen	15.69	2.60
53B	ND	ND	ND	ND	15.84	ND
55B	8:22	14.08	13.98	0.10	20.89	6.89
56B	8:20	20.39	20.31	0.08	22.49	2.17
58B	8:14	10.92	10.77	0.15	16.86	6.06
60B	7:58	8.54	8.44	0.10	14.58	6.13
62B	8:10	22.38	22.12	0.26	28.48	6.32
73B	8:20	22.37	22.25	0.12	21.94	-0.33
74B	8:32	12.38	12.28	0.10	18.49	6.19
75B	8:01	1.80	--	--	6.28	4.48
76B	7:58	7.47	--	--	12.91	5.44
77B	12:40	7.43	--	--	12.88	5.45
78B	12:38	3.50	--	--	8.42	4.92
79B	10:52	13.44	--	--	19.26	5.82
80B	10:44	14.03	--	--	19.70	5.67
81B	10:03	11.82	--	--	16.96	5.14
83B1	9:24	5.92	--	--	10.93	5.01
P2	9:37	12.44	11.74	0.70	17.12	5.25
P3	9:29	12.07	10.94	1.13	16.93	5.78
P4	9:31	12.28	11.24	1.04	16.76	5.32
PZ2	9:33	14.59	13.54	1.05	19.22	5.48
Zone B2 Wells (Carbonate Sediment)						
13B2	8:24	12.82	--	--	17.87	5.05
15B2	8:14	6.49	--	--	11.57	5.08
16B2	9:04	7.92	--	--	13.06	5.14
76B2	7:57	8.61	--	--	14.12	5.51
83B2	9:23	5.89	--	--	10.91	5.02

TABLE 4-1
Groundwater Level Data
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Date: September 17, 2003

Well Number	Time	Depth to Water (ft below reference point)	Depth to FPH (ft below reference point)	FPH Thickness (ft)	Reference Point Elevation (ft amsl)	Groundwater Elevation (ft amsl)
84B2	8:36	5.11	--	--	10.14	5.03
85B2	8:40	12.04	--	--	17.09	5.05
TB2	9:47	11.80	--	--	16.93	5.13
TB3	10:00	12.23	--	--	17.15	4.92
MP-5B2	8:05	5.28	--	--	10.44	5.16

Gauging Station	Time	Depth to Water (ft below reference point)	Reference Point Elevation (ft amsl)	Surface Water Elevation (ft amsl)
Surface Water Monitoring Points				
LLC-3	13:28	4.02	8.72	4.70
LLC-4	11:56	3.94	7.32	3.38

Notes: '- -' = no product

ND = no data available as interface probe could not be advanced past ejector pump.

FPH = Free-phase hydrocarbon

amsl = above mean sea level

Reference point elevation refers to the top of casing for all wells except 27A, 28AB, 33A, 36B, 39A, 40B, 70A, 73B, and 76B where it refers to the top of the security casing.

FPH thicknesses were measured with an electronic interface probe. Water surface elevations are corrected for any FPH thicknesses as shown below.

An FPH specific gravity of 0.76 was applied in determining the groundwater elevation for wells 8AB, 12AB, and P4.

An FPH specific gravity of 0.81 was applied in determining the groundwater elevation for wells 27A, 31A, 39A, 47A, B4, B8, B13, B20, T1, T2, T3, T4, T9, T10, 3AB, 5AB, 24AB, 28AB, 34AB, 43B, 45B, 50B, 51B, 55B, 58B, 73B, 74B, P1, P2, P3, and PZ2.

An FPH specific gravity of 0.86 was applied in determining the groundwater elevation for wells 40B, 56B, 60B, and 62B

Wells 22A, 39A, 57A, 82A, MP-9, and MP-10 were not used in the construction of Figure 4-3 since they had anomalous groundwater elevations. See Section 4.3 for a discussion.

Wells 5AB, 34C, 52B, 56B, and 73B were not used in the construction of Figure 4-4 since they had anomalous groundwater elevations. See Section 4.4 for a discussion.

TABLE 4-2
Water Levels at Nested Wells for Vertical Gradient Evaluation
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

Well	Screen Elevation (ft amsl)		17-Sep-03				8-Jan-04			
	top	bottom	Water Level (ft amsl)	Vertical Gradient			Water Level (ft amsl)	Vertical Gradient		
				Water Level Difference (ft)	Vertical Gradient (ft/ft)	Vertical Gradient Direction		Water Level Difference (ft)	Vertical Gradient (ft/ft)	Vertical Gradient Direction
MW-83A	7.7	-2.3	6.05	-1.04	-0.039	Down	7.49	-2.28	-0.085	Down
MW-83B1	-19.1	-29.1	5.01				5.21			
MW-83B1	-19.1	-29.1	5.01	0.01	0.0004	Up	5.21	-0.02	-0.001	Down
MW-83B2	-43.0	-53.0	5.02				5.19			
MW-84A	1.8	-8.2	3.76	1.27	0.035	Up	5.32	-0.10	-0.003	Down
MW-84B2	-34.8	-44.8	5.03				5.22			
MW-85A	10.1	0.1	9.72	-4.67	-0.114	Down	10.79	-5.58	-0.136	Down
MW-85B2	-30.9	-40.9	5.05				5.21			
MW-13A	9.9	-0.1	11.67	-6.62	-0.185	Down	12.88	-7.68	-0.215	Down
MW-13B2	-25.8	-35.8	5.05				5.20			
MW-15A	-1.4	-11.4	5.84	-0.76	-0.028	Down	6.82	-1.59	-0.060	Down
MW-15B2	-28.1	-38.1	5.08				5.23			
MW-16A	9.0	-6.0	7.70	-2.56	-0.070	Down	8.07	-2.73	-0.075	Down
MW-16B2	-29.9	-39.9	5.14				5.34			
MW-81B	-4.7	-14.7	5.14	-0.22	-0.010	Down	5.36	-0.19	-0.008	Down
MW-TB3	-27.3	-37.3	4.92				5.17			
MW-2AB	4.0	-13.5	5.18	-0.05	-0.002	Down	5.46	-0.11	-0.004	Down
MW-TB2	-25.6	-35.6	5.13				5.35			
MP-5A	-8.0	-18.0	5.36	-0.20	-0.006	Down	5.96	-0.64	-0.018	Down
MP-5B2	-42.9	-52.9	5.16				5.32			
MW-76A	6.9	-3.1	6.91	-1.40	-0.034	Down	7.19	-1.40	-0.034	Down
MW-76B	-33.9	-43.9	5.51				5.79			

TABLE 4-3
Monitoring Well Specifications
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Well ID	Construction Date	Elevation of Top of Casing (ft amsl)	Land Surface Elevation (ft amsl)	Well Depth (ft bgl)	TD (ft below TOC)	Casing Diameter (inch)	Casing Length (ft below TOC)	Stick-Up Height (ft agl)	Screen Slot Size (inch)	Screen Length (ft)	Elevation of Top and Bottom of Screen (ft amsl)		Depth to Top and Bottom of Screen (ft bgl)	
											Top	Bottom	Top	Bottom
B-1	18-Feb-99	14.45	12.75	12.0	13.7	2	3.7	1.7	0.020	10	10.8	0.8	2	12
B-2	18-Feb-99	15.66	13.76	13.2	15.1	2	5.1	1.9	0.020	10	10.6	0.6	3.2	13.2
B-9	18-Feb-99	14.96	12.66	12.7	15.0	2	5.0	2.3	0.020	10	10.0	0.0	2.7	12.7
B-11	9-May-01	15.04	12.54	10.7	14.9	1.25	4.9	4.2	0.020	10	10.1	0.1	0.7	10.7
B-15	9-May-01	11.66	11.93	10.9	10.6	1.25	0.6	-0.3	0.020	10	11.1	1.1	0.9	10.9
B-16	9-May-01	12.13	12.31	14.0	13.8	1.25	3.8	-0.2	0.020	10	8.3	-1.7	4	14
EB-101	7-Aug-91	14.07	12.41	22.2	24.2	2	14.0	2.0	0.020	10	0.1	-9.9	12	22
MP-1	26-Aug-99	10.15	8.48	21.8	23.5	2	20.5	1.7	0.020	3	-10.4	-13.4	18.8	21.8
MP-5A	20-Aug-99	9.52	7.52	18.5	20.5	2	17.5	2.0	0.020	3	-8.0	-11.0	15.5	18.5
MP-5B2	29-May-03	10.44	7.92	60.5	63.5	2	53.3	3.0	0.020	10	-42.9	-52.9	50.3	60.3
MP-9	29-May-03	10	7.12	12.0	15.0	1.25	5.0	3.0	0.020	10	5.0	-5.0	2	12
MP-10	30-May-03	10.15	7.01	11.4	14.8	1.25	4.8	3.4	0.020	10	5.4	-4.7	1.4	11.4
MW-13A	28-Feb-03	17.76	15.21	15.2	18.1	2	7.9	2.9	0.020	10	9.9	-0.1	5	15
MW-13B2	28-Feb-03	17.87	15.11	50.9	53.9	2	43.7	3.0	0.020	10	-25.8	-35.8	40.7	50.7
MW-15A	3-Apr-86	10.62	10.10	21.7	22.2	2	12.0	0.5	0.020	10	-1.4	-11.4	9	19
MW-15B2	6-Mar-03	11.57	10.19	48.0	49.9	2	39.7	1.9	0.020	10	-28.1	-38.1	37.8	47.8
MW-16A	2-Apr-86	10.66	10.30	16.5	16.9	2	1.7	0.4	0.020	15	9.0	-6.0	10	25
MW-16B2	11-Mar-03	13.06	10.47	50.2	53.2	2	43.0	3.0	0.020	10	-29.9	-39.9	40	50
MW-20B	4-Apr-85	9.06	8.10	83.3	84.3	2	69.6	1.0	0.020	14.5	-60.5	-75.0	70.1	84.6
MW-21B	8-Apr-85	6.17	5.00	52.8	54.0	2	38.8	1.2	0.020	15	-32.6	-47.6	39.1	54.1
MW-30A2	14-Mar-03	17.36	14.75	13.2	16.2	2	6.0	3.0	0.020	10	11.4	1.4	3	13
MW-41A	1-Apr-86	21.75	19.30	14.0	16.5	2	6.5	2.5	0.020	10	15.3	5.3	4	14
MW-59A	25-May-88	15.21	13.34	11.0	12.9	4	2.9	1.9	0.020	10	12.3	2.3	1	11
MW-60B	26-May-88	14.58	12.78	27.7	29.5	4	24.3	1.8	0.020	5	-9.7	-14.7	22.5	27.5
MW-61A	3-Jun-88	14.74	12.09	17.0	19.7	2	4.5	2.7	0.020	15	10.2	-4.8	2	17
MW-72A	15-Jun-88	18.66	16.34	17.0	19.3	2	4.1	2.3	0.020	15	14.6	-0.4	2	17
MW-75B	20-Jun-89	6.28	3.98	56.0	58.3	2	48.1	2.3	0.020	10	-41.8	-51.8	45	55
MW-76A	22-May-03	13.89	11.36	14.2	17.2	2	7.0	3.0	0.020	10	6.9	-3.1	4	14
MW-76B2	21-May-03	14.12	11.41	55.2	58.2	2	48.0	3.0	0.020	10	-33.9	-43.9	45	55
MW-78B	23-Jun-89	8.42	6.62	95.0	96.8	2	86.6	1.8	0.020	10	-78.2	-88.2	82	92
MW-82A	16-Dec-93	17.30	15.30	26.5	28.5	4	18.0	2.0	0.020	10	-0.7	-10.7	16	26
MW-83A	5-Mar-03	11.77	9.00	11.4	14.3	2	4.1	2.9	0.020	10	7.7	-2.3	1.2	11.2
MW-83B1	13-Mar-03	10.93	8.21	37.2	40.2	2	30.0	3.0	0.020	10	-19.1	-29.1	27	37

TABLE 4-3
Monitoring Well Specifications
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 2 of 2)

Well ID	Construction Date	Elevation of Top of Casing (ft amsl)	Land Surface Elevation (ft amsl)	Well Depth (ft bgl)	TD (ft below TOC)	Casing Diameter (inch)	Casing Length (ft below TOC)	Stick-Up Height (ft agl)	Screen Slot Size (inch)	Screen Length (ft)	Elevation of Top and Bottom of Screen (ft amsl)		Depth to Top and Bottom of Screen (ft bgl)	
											Top	Bottom	Top	Bottom
MW-83B2	19-Feb-03	10.91	8.29	61.1	64.1	2	53.9	3.0	0.020	10	-43.0	-53.0	50.9	60.9
MW-84A	26-Feb-03	10.23	7.33	15.2	18.6	2	8.4	3.4	0.020	10	1.8	-8.2	5	15
MW-84B2	25-Feb-03	10.14	7.37	52.1	55.1	2	44.9	3.0	0.020	10	-34.8	-44.8	41.9	51.9
MW-85A	5-Mar-03	16.92	14.38	14.0	17.0	2	6.8	3.0	0.020	10	10.1	0.1	3.8	13.8
MW-85B2	4-Mar-03	17.09	14.37	55.2	58.2	2	48.0	3.0	0.020	10	-30.9	-40.9	45	55
MW-86A	30-May-03	11.53	8.91	21.2	24.2	2	14.0	3.0	0.020	10	-2.5	-12.5	11	21
MW-87A	4-Jun-03	27.58	25.46	19.2	22.0	2	11.8	2.8	0.020	10	15.8	5.8	9	19
MW-88A	6-Jun-03	24.97	22.47	14.2	17.2	2	7.0	3.0	0.020	10	18.0	8.0	4	14
MW-89A	5-Jun-03	25.77	23.28	15.5	18.3	2	8.1	2.8	0.020	10	17.7	7.7	5.3	15.3
MW-90A	2-Jun-03	24.01	21.38	14.2	17.2	2	7.0	3.0	0.020	10	17.0	7.0	4	14
MW-91A	2-Jun-03	22.7	20.13	14.2	17.3	2	7.1	3.1	0.020	10	15.6	5.6	4	14
MW-92A	18-Jul-03	13.02	9.21	11.2	15.2	1	5.0	4.0	0.010	10	8.0	-2.0	1	11
MW-93A	18-Jul-03	18.73	16.09	12.1	15.1	1	5.0	3.0	0.010	10	13.7	3.7	2	12
MW-94A	18-Jul-03	18.77	15.86	12.1	15.2	1	5.1	3.1	0.010	10	13.7	3.7	2	12
MW-95A	18-Jul-03	28.36	25.69	19.1	22.1	1	12.1	3.0	0.010	10	16.3	6.3	9	19
MW-96A	11-May-01	17.8	14.82	8.0	11.1	1.25	3.6	3.1	0.020	7.5	14.2	6.7	0.5	8
MW-97A	11-May-01	20.31	17.34	15.0	18.0	1.25	8.0	3.0	0.020	10	12.3	2.3	5	15
MW-TB2	18-Jul-01	16.93	13.26	50.7	54.4	2	44.2	3.7	0.020	10	-27.3	-37.3	40.5	50.5
MW-TB3	31-Aug-01	17.15	14.58	49.2	52.9	2	42.7	3.7	0.020	10	-25.6	-35.6	39	49

Notes:
amsl = above mean sea level
bgl = below ground level
agl = above ground level
TD = Total Well Depth
TOC = Top of Casing
Bottom cup below screen area is 0.2 ft long
MW-96A was formerly identified as AOC 2-8
MW-97A was formerly identified as AOC 3-5

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	B-1	B-2	B-9	B-11	B-15	B-16	EB-101	MP-1	MP-5A
Sample Date	15-Jul-03	15-Jul-03	15-Jul-03	15-Jul-03	16-Jul-03	17-Jul-03	15-Jul-03	17-Jul-03	14-Jul-03
Initial Static Water Level (ft TOC)	1.57	5.03	2.30	5.90	3.00	3.76	5.15	3.88	3.37
Temperature (C)	29.08	29.35	28.35	30.40	29.43	30.84	28.39	27.36	27.95
Dissolved Oxygen (mg/l)	0.40	1.16	0.86	2.52	0.78	5.61	1.02	0.84	1.36
ORP (mv)	-42.2	74.5	-9.2	12.4	-23.2	76.6	-18	29.5	208.1
Specific Conductivity (uS/cm)	644	818	413	945	988	838	313	631	228
pH	7.01	6.44	7.08	7.37	6.88	7.91	6.79	6.34	5.84
Notes:		1		2					

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 2 of 6)

Well	MP-5B2	MP-9	MP-10	MW-13A	MW-13B2	MW-15A	MW-15B2	MW-16A	MW-16B2
Sample Date	14-Jul-03	18-Jul-03	18-Jul-03	12-May-03	12-May-03	12-May-03	12-May-03	9-May-03	12-May-03
Initial Static Water Level (ft TOC)	5.17	5.32	5.16	6.33	13.12	5.01	6.85	2.81	8.26
Temperature (C)	27.08	28.97	29.30	28.7	28.0	28.4	27.7	29.0	28.4
Dissolved Oxygen (mg l)	0.54	1.33	1.10	0.62	1.21	6.34	10.12	8.47	6.83
ORP (mv)	-52.3	136.8	138.0	50.0	10.7	121.2	-29.2	55.5	-59.3
Specific Conductivity (uS cm)	984	1112	1592	405	671	721	1162	973	823
pH	6.99	5.68	5.62	6.32	7.21	6.01	6.92	6.02	6.86

Notes:

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	MW-20B	MW-21B	MW-30A2	MW-41A	MW-59A	MW-61A	MW-72A	MW-75B	MW-76A
Sample Date	13-May-03	13-May-03	14-May-03	21-Jul-03	21-Jul-03	13-May-03	13-May-03	13-May-03	18-Jul-03
Initial Static Water Level (ft TOC)	4.82	1.83	7.67	7.83	3.09	5.08	4.51	2.01	6.23
Temperature (C)	26.7	25.8	28.5	30.05	29.24	29.2	28.2	26.2	27.3
Dissolved Oxygen (mg l)	2.12	5.35	5.91	0.94	1.30	3.55	3.30	6.73	2.67
ORP (mv)	100.1	125.7	-11.7	-26.3	43.8	11.9	175.9	70.0	85.6
Specific Conductivity (uS cm)	1258	1181	591	268	335	222	377	863	1220
pH	7.19	6.94	6.49	7.01	6.76	6.39	7.39	6.82	5.99
Notes:									

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 4 of 6)

Well	MW-76B2	MW-78B	MW-82A	MW-83A	MW-83B1	MW-83B2	MW-84A	MW-84B2	MW-85A
Sample Date	18-Jul-03	13-May-03	21-Jul-03	14-May-03	14-May-03	14-May-03	14-May-03	14-May-03	14-May-03
Initial Static Water Level (ft TOC)	8.30	4.12	12.21	6.28	6.34	6.30	7.43	5.55	8.91
Temperature (C)	26.09	26.7	27.54	28.4	26.7	26.4	26.9	26.9	27.2
Dissolved Oxygen (mg/l)	0.44	2.02	0.81	2.06	1.73	1.80	10.50	11.37	2.48
ORP (mv)	-70.7	170.5	-75.1	-64.3	48.1	78.4	-30.7	-6.3	133.6
Specific Conductivity (uS cm)	1947	3471	656	1197	840	1216	761	917	715
pH	6.61	6.84	6.16	11.64	7.04	7.12	6.36	6.97	6.46
Notes:									

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 5 of 6)

Well	MW-85B2	MW-86A	MW-87A	MW-88A	MW-89A	MW-90A	MW-91A	MW-92A	MW-93A
Sample Date	14-May-03	16-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03	23-Jul-03	27-Jul-03
Initial Static Water Level (ft TOC)	12.52	5.92	10.80	15.88	5.35	14.97	17.39	4.32	13.15
Temperature (C)	27.3	29.0	28.89	30.80	29.73	29.65	30.44	27.59	29.65
Dissolved Oxygen (mg/l)	1.89	0.50	4.27	0.68	2.11	1.04	0.81	0.59	3.14
ORP (mv)	-8.7	57.5	93.3	69.5	56.1	98	43.1	23.5	172
Specific Conductivity (uS/cm)	702	3377	615	3312	603	443	761	603	572
pH	7.25	6.06	7.30	6.03	6.00	7.32	6.52	7.03	6.07
Notes:				3					4

TABLE 4-4
Well Purging Physiochemical Parameters - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	MW-94A	MW-95A	MW-96A	MW-97A	MW-TB2	MW-TB3
Sample Date	25-Jul-03	23-Jul-03	22-Jul-03	22-Jul-03	12-May-03	13-May-03
Initial Static Water Level (ft TOC)	4.90	20.95	4.89	6.10	12.19	13.08
Temperature (C)	30.04	31.7	30.79	29.72	28.9	27.7
Dissolved Oxygen (mg l)	0.90	7.62	4.50	2.68	0.87	1.39
ORP (mv)	178.4	213.1	138.0	286.4	33.6	172.3
Specific Conductivity (uS cm)	1533	114	207	150	729	774
pH	5.64	5.92	6.20	4.90	7.03	6.84
Notes:	5	6				

Notes: Measurements were taken during purging about every five minutes. The measurements shown in the table are at the end of purging.
The initial static water levels shown are prior to purging in ft below top of casing (TOC).

1. Well B-2 was sampled over two days due to low yield. Purging and sampling for VOCs/BNAs was performed on 7/15/03, and sampling for metals on 7/16/03.
2. Well B-11 was sampled over three days due to low yield. Purging was performed on 7/15/03, sampling for VOCs/BNAs on 7/16/03, and sampling for metals on 7/17/03.
3. Well MW-88A was sampled over several days due to low yield. Purging was performed on 7/15/03, sampling for VOCs/BNAs on 7/16/03, and sampling for metals on 7/23 and 7/25/03.
4. Well MW-93A went dry during the first 10 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Sampling for total and dissolved metals was performed on 7/27/03 and 8/4/03, respectively.
5. Well MW-94A went dry during the first 20 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Sampling for total and dissolved metals was performed on 7/25/03 and 7/26/03, respectively.
6. Well MW-95A went dry during the first 15 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Sampling for total and dissolved metals was performed on 7/28/03 and 8/4/03, respectively.

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	B-1	B-2	B-9	B-11	B-15	B-16	EB-101	MP-1	MP-5A
Sample Date	15-Oct-03	8-Oct-03	14-Oct-03	16-Oct-03	16-Oct-03	16-Oct-03	8-Oct-03	8-Oct-03	7-Oct-03
Initial Static Water Level (ft TOC)	1.81	7.21	2.93	5.55	2.91	3.76	5.32	4.57	4.10
Drawdown (ft)	1.05	3.21	12.59	9.35	0.04	0.43	0.00	0.70	0.31
Temperature (C)	28.62	29.93	28.41	29.82	30.65	30.30	28.68	27.19	27.83
Dissolved Oxygen (mg l)	13.66	1.01	9.63	0.32	0.51	18.86	0.61	0.75	0.55
ORP (mv)	22.9	-22.8	-41.7	-127.6	-22.3	-4.8	25.4	10.0	307.5
Specific Conductivity (uS cm)	708	897	419	1004	1022	1060	321	639	219
pH	7.01	6.56	7.13	7.08	6.68	7.23	6.49	6.20	5.35
Notes:			1	2					

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 2 of 6)

Well	MP-5B2	MP-9	MP-10	MW-13A	MW-13B2	MW-15A	MW-15B2	MW-16A	MW-16B2
Sample Date	9-Oct-03	15-Oct-03	15-Oct-03	6-Oct-03	6-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03
Initial Static Water Level (ft TOC)	5.20	4.42	4.32	6.19	12.81	4.90	6.35	2.20	7.66
Drawdown (ft)	0.12	0.15	0.45	0.62	0.03	0.00	0.01	0.44	0.02
Temperature (C)	27.54	29.16	28.24	28.60	28.33	28.17	27.82	29.26	29.09
Dissolved Oxygen (mg/l)	0.52	1.30	1.91	0.37	0.83	5.21	1.29	0.80	1.28
ORP (mv)	-87.8	468.5	185.0	41.3	-45.5	128.2	6.0	52.7	-6.8
Specific Conductivity (uS/cm)	908	1166	1538	248	747	760	1299	961	872
pH	6.82	5.41	4.98	5.71	6.82	6.20	6.91	5.90	6.81
Notes:									

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 3 of 6)

Well	MW-20B	MW-21B	MW-30A2	MW-41A	MW-59A	MW-60B	MW-61A	MW-72A	MW-75B
Sample Date	8-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03	13-Oct-03	8-Dec-03	9-Oct-03	9-Oct-03	6-Oct-03
Initial Static Water Level (ft TOC)	4.02	1.14	6.38	7.32	2.37	8.62	3.86	4.01	1.80
Drawdown (ft)	0.00	0.02	1.56	5.68	1.36	0.00	0.78	1.26	0.06
Temperature (C)	26.35	26.56	30.66	30.27	29.90	28.89	29.72	28.75	26.74
Dissolved Oxygen (mg l)	0.88	1.87	0.87	4.96	1.27	0.95	1.23	2.70	1.52
ORP (mv)	49.5	302.5	-80.3	14.9	86.4	-69.9	-24.9	279.5	146.3
Specific Conductivity (uS/cm)	1443	1201	723	211	445	688	259	378	879
pH	6.97	6.65	6.53	6.48	6.54	6.58	6.29	7.21	6.55

Notes:

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	MW-76A	MW-76B2	MW-78B	MW-82A	MW-83A	MW-83B1	MW-83B2	MW-84A	MW-84B2
Sample Date	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	6-Oct-03	6-Oct-03
Initial Static Water Level (ft TOC)	7.49	8.61	3.48	11.69	5.60	5 75	5.73	6.30	4.92
Drawdown (ft)	0.16	0.09	0.03	0.12	0.71	0 02	0.00	2.22	0.04
Temperature (C)	26.94	26.15	26.62	28.04	28.58	26.68	27.06	28.00	27.43
Dissolved Oxygen (mg/l)	0.35	0.34	1.21	1.17	0.77	1 41	1.67	1.41	0.48
ORP (mv)	117.6	114.0	193.0	-4.1	23.4	-7.9	100.0	45.6	53.0
Specific Conductivity (uS/cm)	1176	1774	3778	668	751	856	1367	654	901
pH	5.93	6.41	6.71	5.75	9.41	6.84	6.91	6.12	6 72

Notes:

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	MW-85A	MW-85B2	MW-86A	MW-87A	MW-88A	MW-89A	MW-90A	MW-91A	MW-92A
Sample Date	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03	10-Oct-03	10-Oct-03	9-Oct-03	13-Oct-03
Initial Static Water Level (ft TOC)	8.01	11.91	5.50	8.68	12.14	5.37	8.37	5.64	4.14
Drawdown (ft)	1.89	0.03	0.10	0.03	0.86	2.59	1.45	2.54	0.18
Temperature (C)	27.85	27.54	29.36	29.36	30.74	28.85	28.48	30.63	27.38
Dissolved Oxygen (mg l)	0.70	0.68	1.86	3.77	2.12	1.11	1.15	1.07	0.52
ORP (mv)	342.9	-63.1	75.2	477.4	126.1	78.4	48.3	-39.2	-12.2
Specific Conductivity (uS cm)	599	686	3490	631	3768	304	404	1062	635
pH	5.86	6.73	5.65	7.05	5.51	5.58	6.37	6.49	6.94
Notes								3	

TABLE 4-6
Groundwater Sampling Analyte List
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well ID	TCL VOCs + MTBE	TCL BNAs	MSL Metals (total + dissolved)	MSL Metals (total)
	R1 + R2	R1 + R2	R1	R2
B-1	X	X	X	X
B-2	X	X	X	X
B-9	X	X	X	X
B-11	X	X	X	X
B-15	X	X	X	X
B-16	X	X	X	X
EB-101	X	X	X	X
MP-1	X	X	X	X
MP-5A	X	X	X	X
MP-5B2	X	X	X	X
MP-9	X	X	X	X
MP-10	X	X	X	X
MW-13A	X	X	X	X
MW-13B2	X	X	X	X
MP-5A	X	X	X	X
MW-15A	X	X	X	X
MW-15B2	X	X	X	X
MW-16A	X	X	X	X
MW-16B2	X	X	X	X
MW-20B	X		X	Pb, Hg
MW-21B	X		X	Pb, Hg
MW-30A2	X	X	X	X
MW-41A			As, Cr	As, Cr
MW-59A			As, Cr	As, Cr
MW-60B	X (R2 only)			
MW-61A	X	X	X	X
MW-72A	X	X	X	X
MW-75B	X		X	Pb, Hg
MW-76A	X	X	X	X
MW-76B2	X	X	X	X
MW-78B	X		Pb, Hg, MSL dissolved	Pb, Hg
MW-82A			As, Cr	As, Cr
MW-83A	X	X	X	X
MW-83B1	X	X	X	X
MW-83B2	X	X	X	X
MW-84A	X	X	X	X
MW-84B2	X	X	X	X
MW-85A	X	X	X	X
MW-85B2	X	X	X	X
MW-86A	X	X	X	X
MW-87A	X	X	As, Cr, Se	As, Cr, Se
MW-88A	X	X	As, Cr, Se	As, Cr, Se
MW-89A	X	X	As, Cr, Se	As, Cr, Se
MW-90A	X	X	As, Cr, Se	As, Cr, Se
MW-91A	X	X	As, Cr, Se	As, Cr, Se
MW-92A			As	As
MW-93A			As	As
MW-94A			As	As
MW-95A			As	As
MW-96A			As	As
MW-97A			As	As
MW-TB2	X	X	X	X
MW-TB3	X	X	X	X

Notes: TCL = Target Compound List
VOC = Volatile Organic Compound
MTBE = methyl-tertiary-butyl ether
R1 = Round 1 of groundwater sampling (May-July 2003)
R2 = Round 2 of groundwater sampling (October 2003)
MSL = Modified Skinner List
BNA = Base Neutral/Acid Extractable Compound

TABLE 4-5
Well Purging Physiochemical Parameters - Second Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well	MW-93A	MW-94A	MW-95A	MW-96A	MW-97A	MW-TB2	MW-TB3
Sample Date	16-Oct-03	13-Oct-03	16-Oct-03	10-Oct-03	10-Oct-03	9-Oct-03	14-Oct-03
Initial Static Water Level (ft TOC)	6.06	4.30	13.20	3.78	5.42	11.57	11.78
Drawdown (ft)	9.16	10.90	8.90	0.14	3.56	0.01	0.00
Temperature (C)	28.74	30.13	30.10	29.82	28.17	28.62	27.66
Dissolved Oxygen (mg/l)	25.13	1.25	2.06	5.24	5.10	0.80	3.23
ORP (mv)	108.4	228.6	295.8	96.2	302.6	-10.7	341.0
Specific Conductivity (uS/cm)	562	1276	125	226	149	850	864
pH	5.62	4.98	4.77	6.34	5.38	6.75	6.75
Notes:	4	5	6				

Notes: Measurements were taken during purging about every five minutes. The measurements shown in the table are at the end of purging
The initial static water levels shown are prior to purging in ft below top of casing (TOC).

1. Well B-9 was sampled over two days due to low yield. Purging, followed by sampling for VOCs was performed on 10/14/03, and sampling for BNAs/metals on 10/15/03.
2. Well B-11 went dry immediately after sampling for VOCs/BNAs. Sampling of metals was performed after well recovered on the same day (10/16/03).
3. Well MW-91A was purged, followed by sampling for VOCs, BNAs, and metals on 10/9/03. Well MW-91A was purged, followed by sampling for BNAs on 10/14/03 due to damage of original BNA sample bottles.
4. Well MW-93A went dry during the first 25 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Purging was performed on 10/14/03, sampling for metals was performed on 10/16/03.
5. Well MW-94A went dry during the first 25 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Purging was performed on 10/13/03, sampling for metals was performed after the well recovered on the same day.
6. Well MW-95A went dry during the first 10 minutes of purging and indicator parameters did not stabilize; indicator measurements shown are for the last purge measurement. Purging was performed on 10/13/03, sampling for metals was performed on 10/16/03.

TABLE 5-1
VOC Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 5)

Sample ID	MCL	MW-13A	MW-13-B2	MW-15A	MW-15-B2	MW-15-B2D	MW-16A	MW-16-B2	MW-20B	MW-21B
Lab ID	or RBSL[1]	N39030-3B	N39030-4B	N39030-8B	N39030-5B	N39030-6B	N38899-3B	N39030-2B	N39129-5B	N39129-3B
Sample Date		12-May-03	12-May-03	12-May-03	12-May-03	12-May-03 duplicate	9-May-03	12-May-03	13-May-03	13-May-03
Reporting units are in ug/l										
Acetone	*610*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	**5**	**11.8**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	*8.5*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	*1900*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Carbon disulfide	*1000*	5.0 UJ	5.0 UJ	1.8 J	5.0 UJ	1.1 J	8.3 U	3.9 J	5.0 U	1.4 J
Carbon tetrachloride	**5**	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 UJ
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.7	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	62.1	0.9 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether (MTBE)	---	4.5	2.4	36.3	9.2	9.2	3.5	6.5	1.0 U	15.8
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 UJ
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	4.4	1.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-1
VOC Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Sample ID	MCL	MW-30A(2)	MW-61A	MW-72A	MW-75B	MW-78B	MW-83A	MW-83-B1	MW-83-B2	MW-83-B2D
Lab ID	or RBSL[1]	N39246-9B	N39129-8B	N39129-6B	N39129-4B	N39129-2B	N39246-5B	N39246-6B	N39246-7B	N39246-8B
Sample Date		5/14/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/14/2003	5/14/2003	5/14/2003	5/14/2003, duplicate
Reporting units are in ug/l										
Acetone	*610*	54.3	5.0 U	5.0 U	5.0 U	5.0 U	16.7	5.0 U	5.0 U	5.0 U
Benzene	**5**	**133**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	*8.5*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	*1900*	30.3	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Carbon disulfide	*1000*	10.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U
Carbon tetrachloride	**5**	2.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.6 J	0.4 J	1.0 U
Chloromethane	*2.1*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	2.0 U	1.0 U	1.0 U	0.8 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	2.0 U	1.0 U	1.0 U	45.3	1.0 U	1.0 U	20.0	15.1	15.2
trans-1,2-Dichloroethene	**100**	2.0 U	1.0 U	1.0 U	6.7	1.0 U	1.0 U	4.3	2.5	2.4
1,2-Dichloropropane	**5**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	81.8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	10.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether (MTBE)	---	2.0 U	1.0 U	1.0 U	7.6	1.0 U	1.0 U	2.8	4.4	4.3
4-Methyl-2-Pentanone (MIBK)	*140*	12.9	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	*0.053*	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	2.0 U	1.0 U	1.0 U	0.8 J	1.0 U	1.0 U	3.6	2.5	2.3
Toluene	**1000**	16.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	2.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	2.0 UJ	1.0 U	1.0 U	**83.8**	1.0 U	1.0 UJ	**154 J**	**127 J**	**126 J**
Vinyl chloride	**2**	2.0 U	1.0 U	1.0 U	**3.1**	1.0 U	1.0 U	**2.6**	1.2	1.1
Xylene (total)	**10,000**	125	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-1
VOC Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 3 of 5)

Sample ID	MCL	MW-84A	MW-84-B2	MW-85A	MW-85-B2	TB-2	TB-3	MW-76A	MW-76B2	MP-1	MP-5A
Lab ID	or RBSL	N39246-4B	N39246-3B	N39246-10B	N39246-11B	N39030-7B	N39129-7B	N44088-2B	N44088-1B	N43954-1B	N43664-3B
Sample Date		5/14/2003	5/14/2003	5/14/2003	5/14/2003	5/12/2003	5/13/2003	18-Jul-03	18-Jul-03	17-Jul-03	14-Jul-03
Reporting units are in ug/l											
Acetone	*610*	21.4	5.0 U	5.0 UJ	18.9 U	5.0 U	5.0 U	10 U	10 U	10 U	10 UJ
Benzene	**5**	0.4 J	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	10 U	10 U	10 U	10 UJ
Carbon disulfide	*1000*	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 UJ	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	0.8 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.86 J
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	0.7 J	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	2.9	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	0.8 J	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ
Methyl Tert Butyl Ether (MTBE)	---	1.0 U	9.9	1.0 UJ	2.9 U	3.5	7.9	1.0 U	0.77 J	1.0 U	1.0 U
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ
Methylene Chloride	**5**	2.0 U	2.0 U	2.0 UJ	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 UJ	**12.9** J	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-1
VOC Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 4 of 5)

Sample ID	MCL	MP-5B2	MP-5B2D	MW-86A	MP-9	MP-10	B-1	B-2	B-9	B-11	B-15	B-16
Lab ID	or RBSL[1]	N43664-1B	N43664-2B	N43858-7B	N44088-3B	N44088-4B	N43858-5B	N43858-2B	N43858-4B	N43858-11B	N43858-13B	N43954-4B
Sample Date		14-Jul-03	14-Jul-03	16-Jul-03	18-Jul-03	18-Jul-03	15-Jul-03	15-Jul-03	15-Jul-03	16-Jul-03	16-Jul-03	17-Jul-03
Reporting units are in ug/l			Duplicate									
Acetone	*610*	10 U	10 UJ	10 U	10 U	6.6 J	10 U	16.5	10 U	5.2 J	10 U	10 U
Benzene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	31.2	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	10 U	10 UJ	10 UJ	10 U	4.6 J	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 U
Carbon disulfide	*1000*	2.0 U	2.0 U	2.0 U	2.0 U	0.49 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 U	0.24 J	1.0 U	1.0 U	1.0 U	1.0 U	0.95 J	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	0.98 J	0.68 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10.5	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether (MTBE)	---	11.4	6.6	3.5	1.0	0.56 J	0.32 J	517 J	1.0 U	0.53 J	4.5	3.3
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.0	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	3.7	2.8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.4	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-1
VOC Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 5 of 5)

Sample ID	MCL	EB-101	MW-87A	MW-88A	MW-89A	MW-90A	MW-91A
Lab ID	or RBSL[1]	N43858-3B	N43858-8B	N43954-3B	N43858-9B	N43954-2B	N43858-10B
Sample Date		15-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03
Reporting units are in ug/l							
Acetone	*610*	7.6 J	5.6 J	10 U	33.8	10 U	258
Benzene	**5**	1.0 U	1.0 U	4.7	0.61 J	1.0 U	2910
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Bromoform	**80**	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	40 U
Bromomethane	*8.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	20 U
2-Butanone (MEK)	*1900*	10 UJ	10 UJ	10 U	10 UJ	10 U	100 UJ
Carbon disulfide	*1000*	2.0 U	2.0 U	2.0 U	0.68 J	2.0 U	20 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Chloroethane	*3.6*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Chloroform	**80**	1.0 U	1.0 U	3.5	0.46 J	13.6	10 U
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Ethylbenzene	**700**	1.0 U	1.0 U	3.7	1.0 U	1.0 U	195
2-Hexanone	*1500*	5.0 U	5.0 UJ	5.0 U	5.0 U	5.0 U	50 U
Methyl Tert Butyl Ether (MTBE)	---	3.0	1.0 U	16.3	0.30 J	1.0 U	10 U
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	83.6
Methylene Chloride	**5**	2.0 U	2.0 U	0.43 J	1.2 J	2.0 U	20 U
Styrene	**100**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Tetrachloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Toluene	**1000**	1.0 U	1.0 U	0.29 J	1.0 U	1.0 U	397
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Trichloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U
Xylene (total)	**10,000**	1.0 U	1.0 U	2.9	1.0 U	1.0 U	2220

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration

--- not available

Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels fc

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 12)

Sample ID	MCL	MW-13A	MW-13B2	MW-15A	MW-15-B2	MW-15-B2D	MW-16A	MW-16-B2
Lab ID	or RBSL[1]	N39030-3B	N39030-4B	N39030-8B	N39030-5B	N39030-6B	N38899-3B	N39030-2B
Sample Date		12-May-03	12-May-03	12-May-03	12-May-03	12-May-03	9-May-03	12-May-03
Reporting units are in ug/l						duplicate		
2-Chlorophenol	*3.0*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
4-Chloro-3-methyl phenol	---	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
2,4-Dichlorophenol	*110*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
2,4-Dimethylphenol	*730*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
2,4-Dinitrophenol	*73*	20.0 U	20.0 U	24.0 U	22.0 U	20.0 U	20.0 U	22.0 U
4,6-Dinitro-o-cresol	*3.7*	20.0 U	20.0 U	24.0 U	22.0 U	20.0 U	20.0 U	22.0 U
2-Methylphenol	*1,800*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
3&4-Methylphenol	*180*	3.3 J	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
2-Nitrophenol	---	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
4-Nitrophenol	*290*	20.0 UJ	20.0 UJ	24.0 UJ	22.0 UJ	20.0 UJ	20.0 UJ	22.0 UJ
Pentachlorophenol	**1**	20.0 U	20.0 U	24.0 U	22.0 U	20.0 U	20.0 U	22.0 U
Phenol	*11,000*	5.0 UJ	5.0 UJ	5.9 UJ	5.6 UJ	5.0 UJ	5.0 UJ	5.6 UJ
2,4,5-Trichlorophenol	---	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
2,4,6-Trichlorophenol	---	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Acenaphthene	*370*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Acenaphthylene	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Anthracene	*1,800*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Benzo(ghi)perylene	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
4-Bromophenyl phenyl ether	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
2-Chloronaphthalene	*490*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
4-Chloroaniline	*150*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Carbazole	*3.3*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Chrysene	*9.2*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
1,2-Dichlorobenzene	**600**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-13A	MW-13B2	MW-15A	MW-15-B2	MW-15-B2D	MW-16A	MW-16-B2
Lab ID	or RBSL[1]	N39030-3B	N39030-4B	N39030-8B	N39030-5B	N39030-6B	N38899-3B	N39030-2B
Sample Date		12-May-03	12-May-03	12-May-03	12-May-03	12-May-03	9-May-03	12-May-03
Reporting units are in ug/l						duplicate		
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
3,3'-Dichlorobenzidine	*0.15*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Dibenzofuran	*24*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Fluorene	*240*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Hexachlorocyclopentadiene	**50**	20.0 U	20.0 U	24.0 U	22.0 U	20.0 U	20.0 U	22.0 U
Hexachloroethane	*4.8*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Isophorone	*70*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
2-Methylnaphthalene	*120*	14.6	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
2-Nitroaniline	---	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
3-Nitroaniline	*3.3*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
4-Nitroaniline	*3.3*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Naphthalene	*6.5*	**37.6**	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
N-Nitrosodiphenylamine	*14*	5.0 U	5.0 U	5.9 U	5.6 U	5.0 U	5.0 U	5.6 U
Phenanthrene	---	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
Pyrene	*180*	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.4 U	2.2 U	2.0 U	2.0 U	2.2 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-30A(2)	MW-61A	MW-72A	MW-83A	MW-83-B1	MW-83-B2	MW-83-B2D
Lab ID	or RBSL[1]	N39246-9B	N39129-8B	N39129-6B	N39246-5B	N39246-6B	N39246-7B	N39246-8B
Sample Date		14-May-03	13-May-03	13-May-03	5-14-03	5-14-03	5-14-03	5-14-03
Reporting units are in ug/l								duplicate
2-Chlorophenol	*3.0*	6.3 U	5.6 UJ	5.3 UJ	5.6 U	5.6 U	5.0 U	5.0 U
4-Chloro-3-methyl phenol	NA	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
2,4-Dichlorophenol	*110*	6.3 U	5.6 UJ	5.3 UJ	5.6 U	5.6 U	5.0 U	5.0 U
2,4-Dimethylphenol	*730*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
2,4-Dinitrophenol	*73*	25.0 U	22.0 U	21.0 U	22.0 U	22.0 U	20.0 U	20.0 U
4,6-Dinitro-o-cresol	*3.7*	25.0 U	22.0 U	21.0 U	22.0 U	22.0 U	20.0 U	20.0 U
2-Methylphenol	*1,800*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
3&4-Methylphenol	*180*	6.3 U	5.6 UJ	5.3 UJ	5.6 U	5.6 U	5.0 U	5.0 U
2-Nitrophenol	NA	6.3 U	5.6 UJ	5.3 UJ	5.6 U	5.6 U	5.0 U	5.0 U
4-Nitrophenol	*290*	25.0 UJ	22.0 UJ	21.0 UJ	22.0 UJ	22.0 UJ	20.0 UJ	20.0 UJ
Pentachlorophenol	**1**	25.0 U	22.0 U	21.0 U	22.0 U	22.0 U	20.0 U	20.0 U
Phenol	*11,000*	6.3 UJ	5.6 UJ	5.3 UJ	1.4 J	5.6 UJ	5.0 UJ	5.0 UJ
2,4,5-Trichlorophenol	NA	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
2,4,6-Trichlorophenol	NA	6.3 U	5.6 UJ	5.3 UJ	5.6 U	5.6 U	5.0 U	5.0 U
Acenaphthene	*370*	2.5 U	2.2 U	2.1 U	2.9	2.2 U	2.0 U	2.0 U
Acenaphthylene	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Anthracene	*1,800*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Benzo(ghi)perylene	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
4-Chloroaniline	*150*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Carbazole	*3.3*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Chrysene	*9.2*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*180*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-30A(2)	MW-61A	MW-72A	MW-83A	MW-83-B1	MW-83-B2	MW-83-B2D
Lab ID	or RBSL[1]	N39246-9B	N39129-8B	N39129-6B	N39246-5B	N39246-6B	N39246-7B	N39246-8B
Sample Date		14-May-03	13-May-03	13-May-03	5-14-03	5-14-03	5-14-03	5-14-03 duplicate
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Dibenzo(a,h)anthracene	*0.0092*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Dibenzofuran	*24*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Di-n-butyl phthalate	*3,700*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Diethyl phthalate	*29,000*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	1.2 J	2.0 U
Fluoranthene	*1,500*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Fluorene	*240*	2.5 U	2.2 U	2.1 U	1.3 J	2.2 U	2.0 U	2.0 U
Hexachlorobenzene	**1**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	25.0 UJ	22.0 U	21.0 U	22.0 UJ	22.0 UJ	20.0 UJ	20.0 UJ
Hexachloroethane	*4.8*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Isophorone	*70*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	11.9	2.2 U	2.1 U	2.2 U	0.6 J	2.0 U	2.0 U
2-Nitroaniline	NA	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
3-Nitroaniline	*3.3*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
4-Nitroaniline	*3.3*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Naphthalene	*6.5*	**82.4**	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Nitrobenzene	*3.5*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	6.3 U	5.6 U	5.3 U	5.6 U	5.6 U	5.0 U	5.0 U
Phenanthrene	NA	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
Pyrene	*180*	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.5 U	2.2 U	2.1 U	2.2 U	2.2 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-84A	MW-84-B2	MW-85A	MW-85-B2	TB-2	TB-3	MW-76A
Lab ID	or RBSL[1]	N39246-4B	N39246-3B	N39246-10B	N39246-11B	N39030-7B	N39129-7B	N44088-2B
Sample Date		5-14-03	5-14-03	5-14-03	5/14/2003	5/12/2003	5/13/2003	18-Jul-03
Reporting units are in ug/l								
2-Chlorophenol	*3.0*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 UJ	5.0 U
4-Chloro-3-methyl phenol	NA	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
2,4-Dichlorophenol	*110*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 UJ	5.0 U
2,4-Dimethylphenol	*730*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
2,4-Dinitrophenol	*73*	22.0 U	22.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
4,6-Dinitro-o-cresol	*3.7*	22.0 U	22.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
2-Methylphenol	*1,800*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
3&4-Methylphenol	*180*	1.9 J	5.6 U	5.0 U	5.0 U	5.0 U	5.1 UJ	5.0 U
2-Nitrophenol	NA	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 UJ	5.0 U
4-Nitrophenol	*290*	22.0 UJ	22.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ	20.0 UJ
Pentachlorophenol	**1**	22.0 U	22.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
Phenol	*11,000*	5.6 UJ	5.6 UJ	5.0 UJ	5.0 UJ	5.0 UJ	5.1 UJ	5.0 UJ
2,4,5-Trichlorophenol	NA	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
2,4,6-Trichlorophenol	NA	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 UJ	5.0 U
Acenaphthene	*370*	0.7 J	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Acenaphthylene	NA	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Anthracene	*1,800*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(ghi)perylene	NA	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	NA	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
4-Chloroaniline	*150*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Carbazole	*3.3*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chrysene	*9.2*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	NA	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	NA	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*180*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-84A	MW-84-B2	MW-85A	MW-85-B2	TB-2	TB-3	MW-76A
Lab ID	or RBSL[1]	N39246-4B	N39246-3B	N39246-10B	N39246-11B	N39030-7B	N39129-7B	N44088-2B
Sample Date		5-14-03	5-14-03	5-14-03	5/14/2003	5/12/2003	5/13/2003	18-Jul-03
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Dibenzo(a,h)anthracene	*0.0092*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibenzofuran	*24*	1.5 J	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Di-n-butyl phthalate	*3,700*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Diethyl phthalate	*29,000*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluoranthene	*1,500*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluorene	*240*	2.1 J	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorobenzene	**1**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	22.0 UJ	22.0 UJ	20.0 UJ	20.0 UJ	20.0 U	20.0 U	20 U
Hexachloroethane	*4.8*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Isophorone	*70*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	5.7	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Nitroaniline	NA	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
3-Nitroaniline	*3.3*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
4-Nitroaniline	*3.3*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Naphthalene	*6.5*	**11.1**	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Nitrobenzene	*3.5*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.6 U	5.6 U	5.0 U	5.0 U	5.0 U	5.1 U	5.0 U
Phenanthrene	NA	3.0	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Pyrene	*180*	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.2 U	2.2 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in ita

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-76B2	MP-1	MP-5A	MP-5B2	MP-5B2D	MW-86A
Lab ID	or RBSL[1]	N44088-1B	N43954-1B	N43664-3B	N43664-1B	N43664-2B	N43858-7B
Sample Date		18-Jul-03	17-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	16-Jul-03
Reporting units are in ug/l						Duplicate	
2-Chlorophenol	*3.0*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
4-Chloro-3-methyl phenol	NA	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
2,4-Dichlorophenol	*110*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
2,4-Dimethylphenol	*730*	5.0 U	5.1 R	5.1 U	5.3 U	5.1 U	5.4 U
2,4-Dinitrophenol	*73*	20.0 U	20.0 U	20.0 U	21.0 U	20.0 U	22.0 U
4,6-Dinitro-o-cresol	*3.7*	20.0 U	20.0 U	20.0 U	21.0 U	20.0 U	22.0 U
2-Methylphenol	*1,800*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
3&4-Methylphenol	*180*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
2-Nitrophenol	NA	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
4-Nitrophenol	*290*	20.0 UJ	20.0 UJ	20.0 UJ	21.0 UJ	20.0 UJ	22.0 U
Pentachlorophenol	**1**	20.0 U	20.0 U	20.0 U	21.0 U	20.0 U	22.0 U
Phenol	*11,000*	5.0 UJ	5.1 UJ	5.1 UJ	5.3 UJ	5.1 UJ	5.4 U
2,4,5-Trichlorophenol	NA	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
2,4,6-Trichlorophenol	NA	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
Acenaphthene	*370*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Acenaphthylene	NA	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Anthracene	*1,800*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Benzo(ghi)perylene	NA	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
4-Bromophenyl phenyl ether	NA	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.0 U	2.1 U		2.2 U
2-Chloronaphthalene	*490*	5.0 U	5.1 U	5.1 U	5.3 U		5.4 U
4-Chloroaniline	*150*	5.0 U	5.1 R	5.1 U			5.4 U
Carbazole	*3.3*	2.0 U	2.0 U	2.0 U			2.2 U
Chrysene	*9.2*	2.0 U	2.0 U	2.0 U			2.2 U
bis(2-Chloroethoxy)methane	NA	2.0 U	2.0 U	2.0 U		2.0 U	2.2 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
4-Chlorophenyl phenyl ether	NA	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
1,2-Dichlorobenzene	**600**	2.0 U	2.0 U	2.0 U	2.1	2.0 U	2.2 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	[illegible] U	2.1 U	2.0 U	2.2 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-76B2	MP-1	MP-5A	MP-5B2	MP-5B2D	MW-86A
Lab ID	or RBSL[1]	N44088-1B	N43954-1B	N43664-3B	N43664-1B	N43664-2B	N43858-7B
Sample Date		18-Jul-03	17-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	16-Jul-03
Reporting units are in ug/l						Duplicate	
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
3,3'-Dichlorobenzidine	*0.15*	5.0 U	5.1 R	5.1 U	5.3 U	5.1 U	5.4 R
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Dibenzofuran	*24*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Fluorene	*240*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Hexachlorocyclopentadiene	**50**	20 U	20.0 U	20 U	21 U	20 U	22 U
Hexachloroethane	*4.8*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Isophorone	*70*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
2-Methylnaphthalene	*120*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
2-Nitroaniline	NA	5.0 U	5.1 R	5.1 U	5.3 U	5.1 U	5.4 U
3-Nitroaniline	*3.3*	5.0 U	5.1 R	5.1 U	5.3 U	5.1 U	5.4 U
4-Nitroaniline	*3.3*	5.0 U	5.1 R	5.1 U	5.3 U	5.1 U	5.4 U
Naphthalene	*6.5*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
N-Nitrosodiphenylamine	*14*	5.0 U	5.1 U	5.1 U	5.3 U	5.1 U	5.4 U
Phenanthrene	NA	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
Pyrene	*180*	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.0 U	2.1 U	2.0 U	2.2 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available. R - rejected

Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 9 of 12)

Sample ID	MCL	MP-9	MP-10	B-1	B-2	B-9	B-11	B-15
Lab ID	or RBSL[1]	N44088-3B	N44088-4B	N43858-5B	N43858-2B	N43858-4B	N43858-11B	N43858-13B
Sample Date		18-Jul-03	18-Jul-03	15-Jul-03	15-Jul-03	15-Jul-03	16-Jul-03	16-Jul-03
Reporting units are in ug/l								
2-Chlorophenol	*3.0*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
4-Chloro-3-methyl phenol	---	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2,4-Dichlorophenol	*110*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2,4-Dimethylphenol	*730*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2,4-Dinitrophenol	*73*	20.0 U	20.0 U	22.0 U	20.0 U	20.0 U	23.0 U	20.0 U
4,6-Dinitro-o-cresol	*3.7*	20.0 U	20.0 U	22.0 U	20.0 U	20.0 U	23.0 U	20.0 U
2-Methylphenol	*1,800*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
3&4-Methylphenol	*180*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2-Nitrophenol	---	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
4-Nitrophenol	*290*	20.0 UJ	20.0 UJ	22.0 U	20.0 U	20.0 U	23.0 U	20.0 U
Pentachlorophenol	**1**	20.0 U	20.0 U	22.0 U	20.0 U	20.0 U	23.0 U	20.0 U
Phenol	*11,000*	5.1 UJ	5.1 UJ	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2,4,5-Trichlorophenol	---	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
2,4,6-Trichlorophenol	---	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Acenaphthene	*370*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Acenaphthylene	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Anthracene	*1,800*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Benzo(ghi)perylene	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
4-Bromophenyl phenyl ether	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
2-Chloronaphthalene	*490*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
4-Chloroaniline	*150*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Carbazole	*3.3*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Chrysene	*9.2*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
1,2-Dichlorobenzene	**600**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MP-9	MP-10	B-1	B-2	B-9	B-11	B-15
Lab ID	or RBSL[1]	N44088-3B	N44088-4B	N43858-5B	N43858-2B	N43858-4B	N43858-11B	N43858-13B
Sample Date		18-Jul-03	18-Jul-03	15-Jul-03	15-Jul-03	15-Jul-03	16-Jul-03	16-Jul-03
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.1 U	5.1 U	5.6 R	5.0 R	5.0 R	5.7 R	5.1 R
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Dibenzofuran	*24*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Fluorene	*240*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Hexachlorocyclopentadiene	**50**	20 U	20 U	22 U	20 U	20 U	23 U	20 U
Hexachloroethane	*4.8*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Isophorone	*70*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
2-Methylnaphthalene	*120*	2.0 U	2.0 U	2.2 U	7.6	2.0 U	2.3 U	2.0 U
2-Nitroaniline	---	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
3-Nitroaniline	*3.3*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
4-Nitroaniline	*3.3*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Naphthalene	*6.5*	2.0 U	2.0 U	2.2 U	52.7	2.0 U	2.3 U	2.0 U
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.1 U	5.1 U	5.6 U	5.0 U	5.0 U	5.7 U	5.1 U
Phenanthrene	---	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
Pyrene	*180*	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.2 U	2.0 U	2.0 U	2.3 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration.

--- not available. R - rejected

Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Sample ID	MCL	B-16	EB-101	MW-87A	MW-88A	MW-89A	MW-90A	MW-91A
Lab ID	or RBSL[1]	N43954-4B	N43858-3B	N43858-8B	N44263-1	N43858-9B	N43954-2B	N43858-10B
Sample Date		17-Jul-03	15-Jul-03	16-Jul-03	22-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03
Reporting units are in ug/l								
2-Chlorophenol	*3.0*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
4-Chloro-3-methyl phenol	---	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
2,4-Dichlorophenol	*110*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
2,4-Dimethylphenol	*730*	5.2 R	5.3 U	5.0 U	5.0 U	5.2 U	5.1 R	113
2,4-Dinitrophenol	*73*	21.0 U	21.0 U	20.0 U	20.0 U	21.0 U	20.0 U	20.0 UJ
4,6-Dinitro-o-cresol	*3.7*	21.0 U	21.0 U	20.0 U	20.0 U	21.0 U	20.0 U	20.0 UJ
2-Methylphenol	*1,800*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	225
3&4-Methylphenol	*180*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	25 UJ
2-Nitrophenol	---	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
4-Nitrophenol	*290*	21.0 UJ	21.0 U	20.0 U	20.0 U	21.0 U	20.0 UJ	20.0 UJ
Pentachlorophenol	**1**	21.0 U	21.0 U	20.0 U	20.0 U	21.0 U	20.0 U	20.0 UJ
Phenol	*11,000*	5.2 UJ	5.3 U	5.0 U	5.0 U	5.2 U	5.1 UJ	5.0 UJ
2,4,5-Trichlorophenol	---	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
2,4,6-Trichlorophenol	---	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 UJ
Acenaphthene	*370*	2.1 U	0.65 J	2.0 U	2.0 U	0.84 J	2.0 U	2.0 U
Acenaphthylene	---	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Anthracene	*1,800*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Benzo(b)fluoranthene	*0.092*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Benzo(ghi)perylene	---	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Benzo(k)fluoranthene	*0.92*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	---	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 U
4-Chloroaniline	*150*	5.2 R	5.3 U	5.0 U	5.0 U	5.2 U	5.1 R	5.0 U
Carbazole	*3.3*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Chrysene	*9.2*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*180*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U

TABLE 5-2
BNA Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	B-16	EB-101	MW-87A	MW-88A	MW-89A	MW-90A	MW-91A
Lab ID	or RBSL[1]	N43954-4B	N43858-3B	N43858-8B	N44263-1	N43858-9B	N43954-2B	N43858-10B
Sample Date		17-Jul-03	15-Jul-03	16-Jul-03	22-Jul-03	16-Jul-03	17-Jul-03	16-Jul-03
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.2 R	5.3 R	5.0 R	5.0 U	5.2 R	5.1 R	5.0 R
Dibenzo(a,h)anthracene	*0.0092*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Dibenzofuran	*24*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 U
Di-n-butyl phthalate	*3,700*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Diethyl phthalate	*29,000*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Fluoranthene	*1,500*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Fluorene	*240*	2.1 U	2.1 U	2.0 U	2.0 U	2.3	2.0 U	1.2 J
Hexachlorobenzene	**1**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	21.0 U	21 U	20 U	20 U	21 U	20.0 U	20 U
Hexachloroethane	*4.8*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 UJ
Isophorone	*70*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	2.1 U	2.1 U	2.0 U	2.1	22.6	2.0 U	68.3
2-Nitroaniline	---	5.2 R	5.3 U	5.0 U	5.0 U	5.2 U	5.1 R	5.0 U
3-Nitroaniline	*3.3*	5.2 R	5.3 U	5.0 U	5.0 U	5.2 U	5.1 R	5.0 U
4-Nitroaniline	*3.3*	5.2 R	5.3 U	5.0 U	5.0 U	5.2 U	5.1 R	5.0 U
Naphthalene	*6.5*	2.1 U	2.1 U	2.0 U	2.0 U	16.9	2.0 U	168
Nitrobenzene	*3.5*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.2 U	5.3 U	5.0 U	5.0 U	5.2 U	5.1 U	5.0 U
Phenanthrene	---	2.1 U	2.1 U	2.0 U	2.0 U	0.61 J	2.0 U	0.85 J
Pyrene	*180*	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.1 U	2.1 U	2.0 U	2.0 U	2.1 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration.

--- not available. R - rejected

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-13A	MW-13AF	MW-13-B2	MW-13-B2F	MW-15A	MW-15AF	MW-15-B2	MW-15-B2F	MW-15-B2D	MW-15-B2DF
Lab ID	or RBSL[1]	N39030-3R	N39030-3A	N39030-4R	N39030-4A	N39030-8R	N39030-8A	N39030-5R	N39030-5A	N39030-6R	N39030-6A
Sample Date		5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total (dupl.)	Dissolved (dupl.)
Antimony	**6**	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Arsenic	**10**	4.8 B	7.9 B	**26.4**	**24.7**	3.6 B	2.7 U	**17.0**	**16.8**	**18.1**	**18.7**
Barium	**2000**	482	483	589	591	67.4 B	58.5 B	736	706	762	739
Beryllium	**4**	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Cadmium	**5**	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Chromium	**100**	0.40 U	0.40 U	2.00 B	0.40 U	4.40 B	0.40 U	0.93 B	0.40 U	0.89 B	0.40 U
Cobalt	*730*	9.6 B	10.7 B	1.0 B	0.6 U	73.3	70.8	1.2 B	0.7 B	1.0 B	0.9 B
Lead	**15**	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Mercury	**2**	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ
Nickel	*730*	23.7 B	3.4 B	1.9 B	1.7 B	12.6 B	12.1 B	5.2 B	5.0 B	4.9 B	4.3 B
Selenium	**50**	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Vanadium	*260*	1.0 U	1.0 U	1.9 B	1.0 U	7.2 B	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-16A	MW-16AF	MW-16-B2	MW-16-B2F	MW-20B	MW-20BF	MW-21B	MW-21BF	MW-30A(2)	MW-30A(2)F
Lab ID	or RBSL[1]	N38899-3	N38899-3A	N39030-2R	N39030-2A	N39129-5	N39129-5A	N39129-3	N39129-3A	N39246-9	N39246-9A
Sample Date		5/10/2003	5/10/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/15/2003	5/15/2003
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Antimony	**6**	2.3 U	2.3 U	2.3 U	2.3 U	2.30 U	2.30 U	2.30 U	2.30 U	2.3 U	3.9 B
Arsenic	**10**	2.7 U	2.7 U	**31.8**	**30.8**	2.80 B	2.70 U	2.70 U	2.70 U	**16.5**	**16.7**
Barium	**2000**	122 B	119 B	654	654	88.1 B	82.2 B	71.8 B	73.0 B	377	390
Beryllium	**4**	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
Cadmium	**5**	0.46 B	0.41 B	0.30 U	0.30 U	0.37 B	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Chromium	**100**	0.40 U	0.40 U	0.40 U	0.40 U	7.70 BJ	0.40 U	11.80 R	28.90 R	0.40 U	0.40 U
Cobalt	*730*	7.7 B	6.0 B	0.6 U	0.6 U	4.50 B	0.60 U	0.60 U	1.10 B	1.2 B	1.7 B
Lead	**15**	1.9 U	1.9 U	1.9 U	1.9 U	1.90 U	1.90 U	1.90 U	1.90 UJ	5.9	4.4
Mercury	**2**	0.09 R	0.09 R	0.09 UJ	0.09 UJ	0.09 U	0.09 U	0.09 U	**2.20**	0.09 UJ	0.09 UJ
Nickel	*730*	3.9 B	2.4 B	6.3 B	6.7 B	5.80 B	4.20 B	3.60 B	3.40 B	1.6 U	1.6 U
Selenium	**50**	3.6 U	3.6 U	3.6 U	3.6 U	3.60 UJ	3.60 UJ	3.60 U	3.60 UJ	3.6 U	3.6 U
Vanadium	*260*	1.0 U	1.0 U	1.0 U	1.0 U	10.2 B	1.00 U	1.00 U	6.10 B	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown
J - estimated concentration
R - rejected based on data validation.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL)
Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-61A	MW-61AF	MW-72A	MW-72AF	MW-75B	MW-75BF	MW-78B	MW-78BF	MW-83A	MW-83AF
Lab ID	or RBSL[1]	N39129-8	N39129-8A	N39129-6	N39129-6A	N39129-4	N39129-4A	N39129-2	N39129-2A	N39246-5	N39246-5A
Sample Date		5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	5/15/2003	5/15/2003
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Antimony	**6**	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	NA	2.3 U	2.3 U	2.3 U
Arsenic	**10**	2.7 B	2.7 U	2.7 U	2.7 U	2.8 B	2.7 U	NA	2.7 U	2.7 U	2.7 U
Barium	**2000**	134 B	132 B	53.6 B	45.3 B	54.1 B	48.2 B	NA	39.5 B	27.9 B	28.4 B
Beryllium	**4**	0.1 U	0.1 U	0.3 B	0.1 B	0.1 U	0.1 U	NA	0.1 U	0.10 B	0.14 B
Cadmium	**5**	0.3 U	0.3 U	0.4 B	0.3 U	0.3 U	0.3 U	NA	0.3 U	0.30 U	0.30 U
Chromium	**100**	0.4 U	0.4 U	1.2 BJ	0.4 U	5.9 B	0.4 U	NA	4.6 BJ	4.80 B	0.40 U
Cobalt	*730*	0.6 B	0.6 B	1.3 B	0.6 U	2.3 B	1.0 B	NA	0.6 U	0.6 U	0.6 U
Lead	**15**	1.9 U	1.9 UJ	1.9 U	1.9 UJ	1.9 U	1.9 U	NA	1.9 U	2.2 U	2.2 U
Mercury	**2**	0.1 U	0.1 U	0.1 U	0.1 U	0.2 B	0.1 U	1.4	0.1 U	0.09 UJ	0.09 UJ
Nickel	*730*	1.6 U	1.6 U	2.1 B	2.3 B	3.8 B	2.0 B	NA	2.0 B	2.5 B	1.6 U
Selenium	**50**	3.6 UJ	3.6 U	3.6 UJ	3.6 U	3.6 U	3.6 UJ	NA	3.6 UJ	3.6 U	3.6 U
Vanadium	*260*	1.0 U	1.0 U	2.5 B	1.3 B	11.0 B	1.0 U	NA	1.0 U	1.8 B	2.5 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
NA - not analyzed since it was not part of the work plan. Total lead at well MW-78B not analyzed due to sample volume accidentally depleted by the lab
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Sample ID	MCL	MW-83-B1	MW-83-B1F	MW-83-B2	MW-83-B2F	MW-83-B2D	MW-83-B2DF	MW-84A	MW-84AF	MW-84-B2
Lab ID	or RBSL[1]	N39246-6	N39246-6A	N39246-7	N39246-7A	N39246-8	N39246-8A	N39246-4	N39246-4A	N39246-3
Sample Date		5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total (dupl.)	Dissolved (dupl.)	Total	Dissolved	Total
Antimony	**6**	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	6.1 B	5.4 B	2.3 U
Arsenic	**10**	2.7 U	3.0 B	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	3.8 B
Barium	**2000**	142 B	139 B	116 B	101 B	127 B	99.8 B	966	895	207
Beryllium	**4**	0.10 U	0.10 U	0.17 B	0.12 B	0.16 B	0.10 B	0.10 U	0.10 U	0.20 B
Cadmium	**5**	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Chromium	**100**	0.41 B	0.40 U	2.80 B	0.81 B	3.20 B	0.40 U	0.40 U	0.40 U	1.60 B
Cobalt	*730*	1.8 B	1.8 B	2.2 B	1.3 B	2.2 B	1.4 B	41.2 B	35.8 B	2.0 B
Lead	**15**	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Mercury	**2**	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ
Nickel	*730*	2.4 B	2.6 B	2.7 B	2.6 B	4.9 B	4.0 B	7.7 B	4.7 B	4.3 B
Selenium	**50**	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Vanadium	*260*	1.0 U	1.0 U	2.0 B	1.0 U	3.2 B	1.0 U	1.0 U	1.0 U	2.3 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-84-B2F	MW-85A	MW-85AF	MW-85-B2	MW-85-B2F	TB-2	TB-2F	TB-3	TB-3F	MW-76A
Lab ID	or RBSL[1]	N39246-3A	N39246-10	N39246-10A	N39246-11	N39246-11A	N39030-7	N39030-7A	N39129-7	N39129-7A	N44088-2
Sample Date		5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/15/2003	5/13/2003	5/13/2003	5/13/2003	5/13/2003	18-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Antimony	**6**	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.8 B	3.5 U
Arsenic	**10**	3.2 B	2.7 U	2.7 U	**69.2**	**64.7**	**36.6**	**33.4**	2.7 U	2.7 U	3.3 U
Barium	**2000**	208	229	254	719	696	704	728	92.3 B	85.3 B	91.5 B
Beryllium	**4**	0.16 B	0.24 B	0.10 U	0.15 B	0.10 U	0.10 U	0.10 U	0.1 U	0.1 U	0.20 U
Cadmium	**5**	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U	0.3 U	0.3 U	0.49 B
Chromium	**100**	0.40 U	0.40 U	0.40 U	2.50 B	0.40 U	0.40 U	0.40 U	0.9 BJ	1.5 B	3.0 B
Cobalt	*730*	1.1 B	1.1 B	0.6 B	3.5 B	2.0 B	1.5 B	0.9 B	0.9 B	1.1 B	22.2 B
Lead	**15**	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	1.9 U	1.9 U	1.9 U	1.9 U	2.2 U
Mercury	**2**	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.09 UJ	0.2 B	0.1 U	0.10 UJ
Nickel	*730*	2.8 B	4.0 B	3.8 B	5.5 B	2.5 B	13.2 B	10.7 B	5.8 B	8.6 B	16.3 BJ
Selenium	**50**	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 UJ	3.6 U	3.1 UJ
Vanadium	*260*	1.0 U	1.0 U	1.1 B	2.4 B	1.0 U	1.0 U	1.0 U	1.5 B	1.6 B	6.6 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL)
Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Sample ID	MCL	MW-76A	MW-76B2	MW-76B2	MP-1	MP-1	MP-5A	MP-5A	MP-5B2	MP-5B2D	MP-5B2
Lab ID	or RBSL[1]	N44088-2A	N44088-1	N44088-1A	N43954-1	N43954-1A	N43664-3	N43664-3A	N43664-1	N43664-2	N43664-1A
Sample Date		18-Jul-03	18-Jul-03	18-Jul-03	17-Jul-03	17-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03	14-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Total (dupl.)	Dissolved
Antimony	**6**	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	2.6 B	2.1 U	2.1 U	2.1 U	2.1 U
Arsenic	**10**	3.3 U	4.5 B	4.5 BJ	3.3 U	3.3 U	2.4 U	2.4 U	9.6 BJ	10.6 J	10.7 J
Barium	**2000**	93.6 B	424	445	317	312	98.0 B	94.1 B	245	246	247
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.12 B	0.10 U	0.10 U	0.10 U	0.10 U
Cadmium	**5**	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.30 U	0.30 U	0.30 U	0.30 U	0.30 U
Chromium	**100**	0.60 U	4.2 B	0.60 U	0.60 U	0.60 U	2.3 B	0.60 U	0.60 U	0.78 B	0.60 U
Cobalt	*730*	23.1 B	5.4 B	4.5 B	63.4	63.2	14.3 B	13.9 B	3.9 B	3.6 B	3.4 B
Lead	**15**	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 B	2.1 U	2.1 U	2.1 U	2.1 U
Mercury	**2**	0.10 UJ	0.10 UJ	0.10 UJ	0.09 UJ	0.09 UJ	0.12 BJ	0.24 J	0.16 BJ	0.09 UJ	0.14 BJ
Nickel	*730*	17.1 BJ	28.0 BJ	20.6 BJ	8.8 B	7.7 B	4.6 B	4.8 B	3.3 B	1.7 U	1.7 U
Selenium	**50**	3.1 UJ	3.1 UJ	3.1 UJ	3.1 U	3.1 U	2.1 U	2.1 U	2.8 BJ	2.1 U	2.2 B
Vanadium	*260*	0.90 U	9.6 B	0.99 B	0.90 U	0.90 U	5.3 B	0.80 U	1.2 B	1.2 B	0.80 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MP-5B2D	MW-86A	MW-86A	MP-9	MP-9	MP-10	MP-10	B-1	B-1	B-2
Lab ID	or RBSL[1]	N43664-2A	N43858-7	N43858-7A	N44088-3	N44088-3A	N44088-4	N44088-4A	N43858-5	N43858-5A	N43858-6
Sample Date		14-Jul-03	16-Jul-03	16-Jul-03	18-Jul-03	18-Jul-03	18-Jul-03	18-Jul-03	15-Jul-03	15-Jul-03	16-Jul-03
Reporting units are in ug/l		Dissolved (dupl.)	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Antimony	**6**	2.1 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Arsenic	**10**	11.9 J	3.3 U	3.3 U	3.3 U	3.3 U	4.4 BJ	4.8 B	3.3 U	3.3 U	3.3 U
Barium	**2000**	236	1050 J	1120 J	247	249	332	109 B	285 J	302 J	357 J
Beryllium	**4**	0.10 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Cadmium	**5**	0.30 U	0.70 B	0.64 B	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Chromium	**100**	0.60 U	3.5 B	0.60 U	0.60 U	0.60 U	3.8 B	0.60 U	2.1 B	0.60 U	2.5 B
Cobalt	*730*	3.2 B	180	189	18.6 B	19.5 B	80.2	106	0.91 B	0.70 U	0.70 U
Lead	**15**	2.1 U	2.2 U	2.2 U	2.2 U	2.2 U	11.2 J	2.2 U	2.2 U	2.2 U	2.7 B
Mercury	**2**	0.14 BJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ
Nickel	*730*	1.7 U	53.2	54.3	5.2 BJ	4.4 BJ	40.8 J	47.5 J	3.7 B	3.8 B	6.5 B
Selenium	**50**	2.1 U	3.1 U	3.1 U	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 U	3.1 U	3.5 BJ
Vanadium	*260*	0.80 U	5.5 B	0.90 U	0.90 U	0.90 U	6.6 B	0.90 U	5.3 B	0.90 U	1.0 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 8 of 11)

Sample ID	MCL	B-2	B-9	B-9	B-11	B-11	B-15	B-15	B-16	B-16	EB-101
Lab ID	or RBSL[1]	N43858-6A	N43858-4	N43858-4A	N43954-5	N43954-5A	N43858-13	N43858-13A	N43954-4	N43954-4A	N43858-3
Sample Date		16-Jul-03	15-Jul-03	15-Jul-03	17-Jul-03	17-Jul-03	16-Jul-03	16-Jul-03	17-Jul-03	17-Jul-03	15-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Antimony	**6**	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Arsenic	**10**	3.3 U	3.3 U	3.7 B	3.3 U	3.3 U	3.3 U	7.2 B	3.3 U	3.3 U	3.3 U
Barium	**2000**	347 J	57.5 BJ	46.1 BJ	71.4 B	74.3 B	69.7 BJ	62.6 BJ	105 B	94.3 B	147 BJ
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.31 B	0.20 U	0.20 U	0.20 U
Cadmium	**5**	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U
Chromium	**100**	0.60 U	1.0 B	0.60 U	3.2 B	0.60 U	0.61 B	1.2 B	1.6 B	0.60 U	0.60 U
Cobalt	*730*	1.8 B	0.70 U	0.70 U	2.4 B	1.7 B	0.70 U	0.70 U	0.70 U	0.70 U	1.4 B
Lead	**15**	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Mercury	**2**	0.10 UJ	0.10 UJ	0.10 UJ	0.09 UJ	0.09 UJ	0.10 UJ	0.10 UJ	0.09 UJ	0.09 UJ	0.10 UJ
Nickel	*730*	3.9 B	3.4 B	4.0 B	4.9 B	2.2 B	5.9 B	6.8 B	5.8 B	4.5 B	3.9 B
Selenium	**50**	3.1 U	3.1 U	3.1 U	3.2 BJ	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
Vanadium	*260*	0.90 U	2.4 B	4.0 B	6.7 B	0.90 U	0.90 U	0.90 U	7.9 B	2.4 B	0.90 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	EB-101	MW-87A	MW-87A	MW-88A	MW-88A	MW-89A	MW-89A	MW-90A	MW-90A	MW-91A
Lab ID	or RBSL[1]	N43858-3A	N43858-8	N43858-8A	N44552-7	N44676-1	N43858-9	N43858-9A	N43954-2	N43954-2A	N43858-10
Sample Date		15-Jul-03	16-Jul-03	16-Jul-03	23-Jul-03	25-Jul-03	16-Jul-03	16-Jul-03	17-Jul-03	17-Jul-03	16-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Antimony	**6**	3.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	**10**	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	7.1 B	8.4 B	3.3 U	3.3 U	8.1 B
Barium	**2000**	153 BJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	**4**	0.20 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	**5**	0.40 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	**100**	0.60 U	12.6 J	11.8 J	0.60 U	0.60 U	0.60 U	1.1 B	0.82 B	0.60 U	5.5 B
Cobalt	*730*	1.8 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**15**	2.2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	**2**	0.10 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	*730*	3.4 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	**50**	3.1 U	3.1 U	3.5 BJ	3.1 UJ	3.1 U	3.1 U	3.3 BJ	3.1 U	3.1 U	5.0 J
Vanadium	*260*	0.90 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration
NA - not analyzed since it was not part of the work plan.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1 EPA Maximum Contaminant Levels (MCLs) are shown in bold For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
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Sample ID	MCL	MW-91A	MW-41A	MW-41A	MW-59A	MW-59A	MW-82A	MW- 82AD	MW-82A	MW-82AD	MW- 92A
Lab ID	or RBSL[1]	N43858-10A	N44264-4	N44264-4A	N44264-5	N44264-5A	N44264-2	N44264-3	N44264-2A	N44264-3A	N44552-9
Sample Date		16-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	23-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Total (dupl.)	Dissolved	Dissolved (dupl.)	Total
Antimony	**6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	**10**	7.5 B	53.9	8.9 B	3.3 U	3.3 U	7.0 B	7.0 B	5.7 B	3.3 U	8.2 B
Barium	**2000**	NA	NA	NA	NA	NA	NA	NA	NA	NA U	NA
Beryllium	**4**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	**5**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	**100**	4.4 B	33.5	0.60 U	0.60 U	0.60 U	0.60 U	1.6 B	0.60 U	0.60 U	0.60 U
Cobalt	*730*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**15**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	**2**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	*730*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	**50**	3.8 BJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	*260*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown

J - estimated concentration.

NA - not analyzed since it was not part of the work plan.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-3
Metal Concentrations in Groundwater - First Round
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Sample ID	MCL	MW-92A	MW-93A	MW-93A	MW-94A	MW-94A	MW-95A	MW-95A	MW-96A	MW-96A	MW-97A	MW-97A
Lab ID	or RBSL[1]	N44552-9A	N44676-9	N45164-2	N44676-5	N44676-6	N44676-10	N45164-1	N44264-6	N44264-6A	N44264-7	N44264-7A
Sample Date		23-Jul-03	27-Jul-03	4-Aug-03	25-Jul-03	26-Jul-03	28-Jul-03	4-Aug-03	22-Jul-03	22-Jul-03	22-Jul-03	22-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Antimony	**6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	**10**	3.6 B	3.3 U	3.3 U	4.7 BJ	5.0 BJ	3.9 BJ	3.3 U	9.3 B	3.3 U	3.3 U	3.3 U
Barium	**2000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	**4**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	**5**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	**100**	0.60 U	1.0 BJ	0.60 U	12.5 J	0.60 U	6.8 BJ	0.60 U	7.8 B	0.60 U	0.60 U	0.70 B
Cobalt	*730*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**15**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	**2**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	*730*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	**50**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	*260*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
NA - not analyzed since it was not part of the work plan.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL)
Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-4
VOC Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 1 of 5)

Sample ID	MCL	B-1	B-2	B-9	B-11	B-15	B-16	EB-101	MP-1	MP-5A	MP-5B2	MP-9
Lab ID	or RBSL[1]	N50984-6	N50401-15	N50720-13	N50984-7	N50984-12	N50984-11	N50401-16	N50401-13	N50200-9A	N50200-8A	N50984-4
Sample Date		15-Oct-03	8-Oct-03	14-Oct-03	16-Oct-03	16-Oct-03	16-Oct-03	8-Oct-03	8-Oct-03	7-Oct-03	7-Oct-03	15-Oct-03
Reporting units are in ug/l												
Acetone	*610*	10 U	50 U	10 U	10 U	12.6	10 U	10 UR	10 U	10 U	4.3 J	10 U
Benzene	**5**	1.0 U	**71.2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	20 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	10 UR	50 UR	10 U	10 UR	10 UR	10 UR	10 UR	10 UR	10 U	10 U	10 UR
Carbon disulfide	*1000*	3.7	10 U	2.0 U	2.1	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	5.0 U	1.0 U	2.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.1	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.6	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	35.1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methy Tert Butyl Ether (MTBE)	---	1.0 U	652.0	1.0 U	1.0 U	2.6	4.0	2.8	1.0 U	1.0 U	5.7	0.96 J
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	10.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	6.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1.0 U
Vinyl chloride	**2**	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	8.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown
J - estimated concentration R - rejected
-- - not available
1 - US EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-4
VOC Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 2 of 5)

Sample ID	MCL	MP-9D	MP-10	MW-13A	MW-13B2	MW-13B2D	MW-15A	MW-15B2	MW-16A	MW-16B2	MW-16B2D
Lab ID	or RBSL[1]	N50984-5	N50984-3	N50200-14A	N50200-12A	N50200-13A	N50401-11	N50401-12	N50401-7	N50401-5	N50401-6
Sample Date		15-Oct-03	15-Oct-03	6-Oct-03	6-Oct-03	6-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03
Reporting units are in ug/l											
Acetone	*610*	10 U	32.6	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 UR
Benzene	**5**	1.0 U	1.0 U	0.34 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	10 UR	10 UR	10 U	10 U	10 U	10 UR	10 UR	10 UR	10 UR	10 UR
Carbon disulfide	*1000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.7 J	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	2.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methy Tert Butyl Ether (MTBE)	---	0.91 J	1.0 U	2.7	3.6	3.6	25.1	10 U	3.1	6.5	6.6
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	0.93 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration R - rejected

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-4
VOC Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 3 of 5)

Sample ID	MCL	MW-29B	MW-21B	MW-30A(2)	MW-60B	MW-60BD	MW-61A	MW-72A	MW-75B	MW-76A	MW-76B2
Lab ID	or RBSL[1]	N50401-8	N50401-9	N50720-11	N54982-3	N54982-4	N50401-17	N50401-4	N50200-15A	N50200-7A	N50200-6A
Sample Date		8-Oct-03	8-Oct-03	14-Oct-03	8-Dec-03	8-Dec-03	9-Oct-03	9-Oct-03	6-Oct-03	7-Oct-03	7-Oct-03
Reporting units are in ug/l											
Acetone	*670*	10 U	10 U	25 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
Benzene	**5**	1.0 U	1.0 U	**114**	0.67 J	0.64 J	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Bromoform	**80**	4.0 U	4.0 U	10.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 UJ	4.0 U
Bromomethane	*8.5*	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 U
2-Butanone (MEK)	*1900*	10 UR	10 UR	25 U	10 U	10 U	10 UR	10 UR	10 U	10 UJ	10 U
Carbon disulfide	*1000*	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Chloroethane	*5.6*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Chloroform	**80**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	**71.7**	1.0 UJ	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	10.4	1.0 UJ	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	110	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U
Methyl Tert Butyl Ether (MTBE)	---	1.0 U	11.5 U	2.5 U	12	13.4	1.0 U	1.0 U	6.0	1.0 UJ	0.78 J
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 UJ	2.0 U
Styrene	**100**	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.5	1.0 UJ	1.0 U
Toluene	**1000**	1.0 U	1.0 U	10.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U
Trichloroethene	**5**	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	**106**	1.0 UJ	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	2.5 U	**2.1**	**2.3**	1.0 U	1.0 U	**5.8**	1.0 UJ	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	202	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration. R - rejected

--- not available

Note 1 - EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-4
VOC Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 4 of 5)

Sample ID	MCL	MW-78P	MW-83A	MW-83B1	MW-83B2	MW-84A	MW-84B2	MW-85A	MW-85B2	MW-86A	MW-87A	MW-88A
Lab ID	or RBSL[1]	N50491-10	N50200-3A	N50200-1A	N50200-2A	N50200-17A	N50200-16A	N50200-5A	N50200-4A	N50401-14	N50720-14	N50720-4
Sample Date		8-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	6-Oct-03	6-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03
Reporting units are in ug/l												
Acetone	*610*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	**5**	1.0 U	1.0 U	1.0 U	1.0 U	0.41 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	8.3
Bromodichloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	2.0 UJ	2.0 UJ	2.0 UJ	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	10 UR	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UR	10 U	10 U
Carbon disulfide	*1000*	2.0 U	2.0 U	2.0 U	2.0 U	1.7 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 UJ	1.0 UJ	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	1.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	15.6	18.1	1.0 U	18.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	2.2	2.2	1.0 U	5.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	6.8
2-Hexanone	*1500*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether (MTBE)	---	1.0 U	1.0 U	2.2	5.5	1.0 U	8.9	1.0 U	6.0	2.7 U	1.0 U	32.2
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	3.4	2.1	1.0 U	1.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	1.0 U	138	122	1.0 U	68.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.9

Any results that exceed MCLs or RBSLs are shown bolded and shaded

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration R - rejected

--- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-4
VOC Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 5 of 5)

Sample ID	MCL	MW-89A	MW-90A	MW-91A	MW-TB2	MW-TB3	MW-TB3D
Lab ID	or RBSL[1]	N50401-23	N50401-21	N50401-18	N50401-3	N50720-7	N50720-8
Sample Date		10-Oct-03	10-Oct-03	9-Oct-03	9-Oct-03	14-Oct-03	14-Oct-03
Reporting units are in ug/l							
Acetone	*610*	10 UR	10 UR	100 UR	10 U	10 U	10 U
Benzene	**5**	0.86 J	1.0 U	**1830**	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	1.0 U	10.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	4.0 U	40.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	2.0 U	20.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	10 UR	10 UR	100 UR	10 UR	10 U	10 U
Carbon disulfide	*1000*	2.9 U	6.3	20 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	**100**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	**80**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	**7**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	1.0 U	1.0 U	390	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	5.0 U	50 U	5.0 U	5.0 U	5.0 U
Methy Tert Butyl Ether (MTBE)	---	1.0 U	1.0 U	10 U	2.9	5.3	5.2
4-Methyl-2-Pentanone (MIBK)	*140*	5.0 U	5.0 U	50 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	2.0 U	20 U	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	5.0 U	50 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	1.0 U	1.0 U	57.4	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	1.0 U	1.0 U	922	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration R - rejected.

--- not available

[1] - EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLs, EPA Region III risk-based screening levels

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	B-1	B-2	B-9	B-11	B-15	B-16	EB-101
Lab ID	or RBSL[1]	N50984-6	N50401-15	N50984-2	N50984-7	N50984-12	N50984-11	N50401-16
Sample Date		15-Oct-03	8-Oct-03	15-Oct-03	16-Oct-03	16-Oct-03	16-Oct-03	8-Oct-03
Reporting units are in ug/l								
2-Chlorophenol	*30*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
4-Chloro-3-methyl phenol	---	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2,4-Dichlorophenol	*110*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2,4-Dimethylphenol	*730*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2,4-Dinitrophenol	*73*	22 U	20 UJ	21 U	23 U	20 U	21 U	20 UJ
4,6-Dinitro-o-cresol	*3.7*	22 UJ	20 U	21 UJ	23 UJ	20 UJ	21 UJ	20 U
2-Methylphenol	*1,800*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
3&4-Methylphenol	*180*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2-Nitrophenol	---	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
4-Nitrophenol	*290*	22 U	20 U	21 U	23 U	20 U	21 U	20 U
Pentachlorophenol	1	22 U	20 UJ	21 U	23 U	20 U	21 U	20 U
Phenol	*11,000*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2,4,5-Trichlorophenol	---	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
2,4,6-Trichlorophenol	---	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Acenaphthene	*370*	2.2 U	2.0 U	2.1 U	3.4	2.0 U	2.1 U	2.0 U
Acenaphthylene	---	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Anthracene	*1,800*	2.2 U	2.0 UJ	2.1 U	0.60 J	2.0 U	2.1 U	2.0 U
Benzo(a)anthracene	*0.092*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Benzo(a)pyrene	**0.2**	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Benzo(ghi)perylene	---	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
4-Bromophenyl phenyl ether	---	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
2-Chloronaphthalene	*490*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
4-Chloroaniline	*150*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Carbazole	*3.3*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Chrysene	*9.2*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
bis(2-Chloroethyl) ether	*0.0095*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
1,2-Dichlorobenzene	**600**	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
1,3-Dichlorobenzene	*180*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
1,4-Dichlorobenzene	**75**	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	B-1	B-2	B-9	B-11	B-15	B-16	EB-101
Lab ID	or RBSL[1]	N50984-6	N50401-15	N50984-2	N50984-7	N50984-12	N50984-11	N50401-16
Sample Date		15-Oct-03	8-Oct-03	15-Oct-03	16-Oct-03	16-Oct-03	16-Oct-03	8-Oct-03
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
2,6-Dinitrotoluene	*37*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.6 U	5.0 UJ	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Dibenzo(a,h)anthracene	*0.0092*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Dibenzofuran	*24*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Di-n-butyl phthalate	*3,700*	2.2 U	2.0 UJ	2.1 U	1.4 J	1.1 J	2.1 U	2.0 U
Di-n-octyl phthalate	*730*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Diethyl phthalate	*29,000*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Dimethyl phthalate	*370,000*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Fluoranthene	*1,500*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Fluorene	*240*	2.2 U	0.84 J	2.1 U	4.5	2.0 U	2.1 U	2.0 U
Hexachlorobenzene	**1**	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Hexachlorobutadiene	*0.86*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Hexachlorocyclopentadiene	**50**	22 U	20 U	21 U	23 U	20 U	21 U	20 U
Hexachloroethane	*4.8*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Isophorone	*70*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
2-Methylnaphthalene	*120*	2.2 U	36.9	2.1 U	1.6 J	2.0 U	2.1 U	2.0 U
2-Nitroaniline	---	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
3-Nitroaniline	*3.3*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
4-Nitroaniline	*3.3*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Naphthalene	*6.5*	2.2 U	174	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
Nitrobenzene	*3.5*	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.2 U	2.0 UJ	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.6 U	5.0 U	5.2 U	5.8 U	5.1 U	5.2 U	5.0 U
Phenanthrene	---	2.2 U	2.0 UJ	2.1 U	1.2 J	2.0 U	2.1 U	2.0 U
Pyrene	*180*	2.2 U	2.0 UJ	2.1 U	0.66 J	2.0 U	2.1 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.2 U	2.0 U	2.1 U	2.3 U	2.0 U	2.1 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration.

--- not available.

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 3 of 12)

Sample ID	MCL	MP-1	MP-5A	MP-5B2	MP-9	MP-9D	MP-10	MW-13A
Lab ID	or RBSL[1]	N50401-13	N50200-9A	N50200-8A	N50984-4	N50984-5	N50984-3	N50200-14A
Sample Date		8-Oct-03	7-Oct-03	7-Oct-03	15-Oct-03	15-Oct-03	15-Oct-03	6-Oct-03
Reporting units are in ug/l						duplicate		
2-Chlorophenol	*3.0*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
4-Chloro-3-methyl phenol	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2,4-Dichlorophenol	*110*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2,4-Dimethylphenol	*730*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2,4-Dinitrophenol	*73*	20 UJ	20 U	20 U	20 U	20 U	20 U	20 U
4,6-Dinitro-o-cresol	*3.7*	20 U	20 U	20 U	20 UJ	20 UJ	20 UJ	20 U
2-Methylphenol	*1,800*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
3&4-Methylphenol	*180*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2-Nitrophenol	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
4-Nitrophenol	*290*	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	**1**	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Phenol	*11,000*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2,4,5-Trichlorophenol	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
2,4,6-Trichlorophenol	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Acenaphthene	*370*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Acenaphthylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Anthracene	*1,800*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(ghi)perylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
4-Chloroaniline	*150*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Carbazole	*3.3*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chrysene	*9.2*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.0 U	0.88 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
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Sample ID	MCL	MP-1	MP-5A	MP-5B2	MP-9	MP-9D	MP-10	MW-13A
Lab ID	or RBSL[1]	N50401-13	N50200-9A	N50200-8A	N50984-4	N50984-5	N50984-3	N50200-14A
Sample Date		8-Oct-03	7-Oct-03	7-Oct-03	15-Oct-03	15-Oct-03	15 Oct-03	6-Oct-03
Reporting units are in ug/l						duplicate		
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibenzofuran	*24*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluorene	*240*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	20 U	20 UJ	20 UJ	20 U	20 U	20 U	20 UJ
Hexachloroethane	*4.8*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Isophorone	*70*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Nitroaniline	---	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
3-Nitroaniline	*3.3*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
4-Nitroaniline	*3.3*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Naphthalene	*6.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.4
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U
Phenanthrene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Pyrene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration.

--- not available.

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
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Sample ID	MCL	MW-13B2	MW-13B2D	MW-15A	MW-15B2	MW-16A	MW-16B2	MW-16B2D	MW-30A(2)
Lab ID	or RBSL[1]	N50200-12A	N50200-13A	N50401-11	N50401-12	N50401-7	N50401-5	N50401-6	N50720-11
Sample Date		6-Oct-03	6-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	14-Oct-03
Reporting units are in ug/l			duplicate					duplicate	
2-Chlorophenol	*3.0*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
4-Chloro-3-methyl phenol	---	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2,4-Dichlorophenol	*110*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2,4-Dimethylphenol	*730*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2,4-Dinitrophenol	*73*	20 U	20 U	20 UJ	20 U	20 U	20 U	20 U	21 UJ
4,6-Dinitro-o-cresol	*3.7*	20 U	20 U	20 U	20 U	20 U	20 U	20 U	21 UJ
2-Methylphenol	*1,800*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
3&4-Methylphenol	*180*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2-Nitrophenol	---	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
4-Nitrophenol	*290*	20 U	20 U	20 U	20 U	20 U	20 U	20 U	21 U
Pentachlorophenol	**1**	20 U	20 U	20 U	20 U	20 U	20 U	20 U	21 U
Phenol	*11,000*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2,4,5-Trichlorophenol	---	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
2,4,6-Trichlorophenol	---	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Acenaphthene	*370*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Acenaphthylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Anthracene	*1,800*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Benzo(ghi)perylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
4-Bromophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
2-Chloronaphthalene	*490*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
4-Chloroaniline	*150*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Carbazole	*3.3*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Chrysene	*9.2*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
1,2-Dichlorobenzene	**600**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	MW-13B2	MW-13B2D	MW-15A	MW-15B2	MW-16A	MW-16B2	MW-16B2D	MW-30A(2)
Lab ID	or RBSL [1]	N50200-12A	N50200-13A	N50401-11	N50401-12	N50401-7	N50401-5	N50401-6	N50720-11
Sample Date		6-Oct-03	6-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	14-Oct-03
Reporting units are in ug/l			duplicate					duplicate	
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
3,3'-Dichlorobenzidine	*0.15*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Dibenzofuran	*24*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Fluorene	*240*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.65 J
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Hexachlorocyclopentadiene	**50**	20 UJ	20 UJ	20 U	20 U	20 U	20 U	20 U	21 U
Hexachloroethane	*4.8*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Isophorone	*70*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
2-Methylnaphthalene	*120*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	36.4
2-Nitroaniline	---	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
3-Nitroaniline	*3.3*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
4-Nitroaniline	*3.3*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Naphthalene	*6.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**122**
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
N-Nitrosodiphenylamine	*14*	5.1 U	5.1 U	5.0 U	5.1 U	5.0 U	5.0 U	5.0 U	5.2 U
Phenanthrene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
Pyrene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.1 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration.

--- not available.

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 7 of 12)

Sample ID	MCL	MW-61A	MW-72A	MW-76A	MW-76B2	MW-83A	MW-83B1	MW-83B2	MW-84A
Lab ID	or RBSL[1]	N50401-17	N50401-4	N50200-7A	N50200-6A	N50200-3A	N50200-1A	N50200-2A	N50200-17A
Sample Date		9-Oct-03	9-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	6-Oct-03
Reporting units are in ug/l									
2-Chlorophenol	*3.0*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
4-Chloro-3-methyl phenol	---	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2,4-Dichlorophenol	*110*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2,4-Dimethylphenol	*730*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2,4-Dinitrophenol	*73*	23 U	24 U	20 U	20 U	21 U	20 U	21 U	21 U
4,6-Dinitro-o-cresol	*3.7*	23 U	24 U	20 U	20 U	21 U	20 U	21 U	21 U
2-Methylphenol	*1,800*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
3&4-Methylphenol	*180*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2-Nitrophenol	---	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
4-Nitrophenol	*290*	23 U	24 U	20 U	20 U	21 U	20 U	21 U	21 U
Pentachlorophenol	**1**	23 U	24 U	20 U	20 U	21 U	20 U	21 U	21 U
Phenol	*11,000*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2,4,5-Trichlorophenol	---	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
2,4,6-Trichlorophenol	---	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Acenaphthene	*370*	2.3 U	2.4 U	2.0 U	2.0 U	1.2 J	2.0 U	2.1 U	2.1 U
Acenaphthylene	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Anthracene	*1,800*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Benzo(a)anthracene	*0.092*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Benzo(a)pyrene	**0.2**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Benzo(b)fluoranthene	*0.092*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Benzo(ghi)perylene	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Benzo(k)fluoranthene	*0.92*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
4-Bromophenyl phenyl ether	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Butyl benzyl phthalate	*7,300*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
2-Chloronaphthalene	*490*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
4-Chloroaniline	*150*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Carbazole	*3.3*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Chrysene	*9.2*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
bis(2-Chloroethoxy)methane	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
bis(2-Chloroethyl) ether	*0.0096*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
bis(2-Chloroisopropyl)ether	*0.26*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
4-Chlorophenyl phenyl ether	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
1,2-Dichlorobenzene	**600**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
1,3-Dichlorobenzene	*180*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
1,4-Dichlorobenzene	**75**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	MW-61A	MW-72A	MW-76A	MW-76B2	MW-83A	MW-83B1	MW-83B2	MW-84A
Lab ID	or RBSL[1]	N50401-17	N50401-4	N50200-7A	N50200-6A	N50200-3A	N50200-1A	N50200-2A	N50200-17A
Sample Date		9-Oct-03	9-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	7-Oct-03	6-Oct-03
Reporting units are in ug/l									
2,4-Dinitrotoluene	*73*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
2,6-Dinitrotoluene	*37*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
3,3'-Dichlorobenzidine	*0.15*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Dibenzo(a,h)anthracene	*0.0092*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Dibenzofuran	*24*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Di-n-butyl phthalate	*3,700*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Di-n-octyl phthalate	*730*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Diethyl phthalate	*29,000*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Dimethyl phthalate	*370,000*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
bis(2-Ethylhexyl)phthalate	**6**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Fluoranthene	*1,500*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Fluorene	*240*	2.3 U	2.4 U	2.0 U	2.0 U	0.56 J	2.0 U	2.1 U	1.2 J
Hexachlorobenzene	**1**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Hexachlorobutadiene	*0.86*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Hexachlorocyclopentadiene	**50**	23 U	24 U	20 UJ	20 UJ	21 UJ	20 UJ	21 UJ	21 UJ
Hexachloroethane	*4.8*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Isophorone	*70*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
2-Methylnaphthalene	*120*	2.3 U	2.4 U	2.0 U	2.0 U	0.60 J	2.0 U	2.1 U	2.1 U
2-Nitroaniline	---	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
3-Nitroaniline	*3.3*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
4-Nitroaniline	*3.3*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Naphthalene	*6.5*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Nitrobenzene	*3.5*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
N-Nitrosodi-n-propylamine	*0.0096*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
N-Nitrosodiphenylamine	*14*	5.7 U	5.9 U	5.1 U	5.0 U	5.2 U	5.1 U	5.2 U	5.3 U
Phenanthrene	---	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
Pyrene	*180*	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U
1,2,4-Trichlorobenzene	**70**	2.3 U	2.4 U	2.0 U	2.0 U	2.1 U	2.0 U	2.1 U	2.1 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration.

--- not available.

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	MW-84B2	MW-85A	MW-85B2	MW-86A	MW-87A	MW-88A	MW-89A
Lab ID	or RBSL[1]	N50200-16A	N50200-5A	N50200-4A	N50401-14	N50720-14	N50720-4	N50401-23
Sample Date		6-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03	10-Oct-03
Reporting units are in ug/l								
2-Chlorophenol	*3.0*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloro-3-methyl phenol	---	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dichlorophenol	*110*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dimethylphenol	*730*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dinitrophenol	*73*	20 U	20 U	20 U	20 UJ	20 UJ	20 UJ	20 U
4,6-Dinitro-o-cresol	*3.7*	20 U	20 U	20 U	20 U	20 UJ	20 UJ	20 U
2-Methylphenol	*1,800*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
3&4-Methylphenol	*180*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	1.8 J
2-Nitrophenol	---	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Nitrophenol	*290*	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Pentachlorophenol	**1**	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Phenol	*11,000*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4,5-Trichlorophenol	---	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
2,4,6-Trichlorophenol	---	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Acenaphthene	*370*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.9 J	0.94 J
Acenaphthylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Anthracene	*1,800*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(ghi)perylene	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloroaniline	*150*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Carbazole	*3.3*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.80 J
Chrysene	*9.2*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	MW-84B2	MW-85A	MW-85B2	MW-86A	MW-87A	MW-88A	MW-89A
Lab ID	or RBSL[1]	N50200-16A	N50200-5A	N50200-4A	N50401-14	N50720-14	N50720-4	N50401-23
Sample Date		6-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03	10-Oct-03
Reporting units are in ug/l								
2,4-Dinitrotoluene	*73*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibenzofuran	*24*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	0.81 J
Di-n-butyl phthalate	*3,700*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Diethyl phthalate	*29,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluoranthene	*1,500*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Fluorene	*240*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.3 J	2.2
Hexachlorobenzene	**1**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	20 UJ	20 UJ	20 UJ	20 U	20 U	20 U	20 U
Hexachloroethane	*4.8*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Isophorone	*70*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	14.8	14.3
2-Nitroaniline	---	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
3-Nitroaniline	*3.3*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Nitroaniline	*3.3*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Naphthalene	*6.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	5.9	**12.3**
Nitrobenzene	*3.5*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.0 U	5.1 U	5.1 U	5.0 U	5.0 U	5.0 U	5.0 U
Phenanthrene	--	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.97 J	0.82 J
Pyrene	*180*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.

J - estimated concentration

--- not available.

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 11 of 12)

Sample ID	MCL	MW-90A	MW-91A	MW-TB2	MW-TB3	MW-TB3 DUP
Lab ID	or RBSL[1]	N50401-21	N50720-12	N50401-3	N50720-7	N50720-8
Sample Date		10-Oct-03	14-Oct-03	9-Oct-03	14-Oct-03	14-Oct-03
Reporting units are in ug/l						duplicate
2-Chlorophenol	*3.0*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
4-Chloro-3-methyl phenol	---	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
2,4-Dichlorophenol	*110*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
2,4-Dimethylphenol	*730*	5.1 U	84.0	5.1 U	5.1 U	5.1 U
2,4-Dinitrophenol	*73*	20 U	22 UJ	20 UJ	20 UJ	20 UJ
4,6-Dinitro-o-cresol	*3.7*	20 U	22 UJ	20 U	20 UJ	20 UJ
2-Methylphenol	*1,800*	5.1 U	13.0	5.1 U	5.1 U	5.1 U
3&4-Methylphenol	*180*	5.1 U	55.4	5.1 U	5.1 U	5.1 U
2-Nitrophenol	---	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
4-Nitrophenol	*290*	20 U	22 U	20 U	20 U	20 U
Pentachlorophenol	**1**	20 U	22 U	20 U	20 U	20 U
Phenol	*11,000*	5.1 U	16.1	5.1 U	5.1 U	5.1 U
2,4,5-Trichlorophenol	---	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
2,4,6-Trichlorophenol	---	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Acenaphthene	*370*	2.0 U	0.74 J	2.0 U	2.0 U	2.0 U
Acenaphthylene	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Anthracene	*1,800*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Benzo(a)anthracene	*0.092*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Benzo(a)pyrene	**0.2**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Benzo(b)fluoranthene	*0.092*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Benzo(ghi)perylene	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Benzo(k)fluoranthene	*0.92*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
4-Bromophenyl phenyl ether	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Butyl benzyl phthalate	*7,300*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
2-Chloronaphthalene	*490*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
4-Chloroaniline	*150*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Carbazole	*3.3*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Chrysene	*9.2*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethoxy)methane	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroethyl) ether	*0.0096*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
bis(2-Chloroisopropyl)ether	*0.26*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
4-Chlorophenyl phenyl ether	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	**600**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
1,3-Dichlorobenzene	*150*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
1,4-Dichlorobenzene	**75**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U

TABLE 5-5
BNA Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 12 of 12)

Sample ID	MCL	MW-90A	MW-91A	MW-TB2	MW-TB3	MW-TB3 DUP
Lab ID	or RBSL[1]	N50401-21	N50720-12	N50401-3	N50720-7	N50720-8
Sample Date		10-Oct-03	14-Oct-03	9-Oct-03	14-Oct-03	14-Oct-03
Reporting units are in ug/l						duplicate
2,4-Dinitrotoluene	*73*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
2,6-Dinitrotoluene	*37*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
3,3'-Dichlorobenzidine	*0.15*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Dibenzo(a,h)anthracene	*0.0092*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Dibenzofuran	*24*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Di-n-butyl phthalate	*3,700*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Di-n-octyl phthalate	*730*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Diethyl phthalate	*29,000*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Dimethyl phthalate	*370,000*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
bis(2-Ethylhexyl)phthalate	**6**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Fluoranthene	*1,500*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Fluorene	*240*	2.0 U	0.75 J	2.0 U	2.0 U	2.0 U
Hexachlorobenzene	**1**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Hexachlorobutadiene	*0.86*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Hexachlorocyclopentadiene	**50**	20 U	22 U	20 UJ	20 U	20 U
Hexachloroethane	*4.8*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Isophorone	*70*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
2-Methylnaphthalene	*120*	2.0 U	47.3	2.0 U	2.0 U	2.0 U
2-Nitroaniline	---	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
3-Nitroaniline	*3.3*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
4-Nitroaniline	*3.3*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Naphthalene	*6.5*	2.0 U	**166**	2.0 U	2.0 U	2.0 U
Nitrobenzene	*3.5*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
N-Nitrosodi-n-propylamine	*0.0096*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
N-Nitrosodiphenylamine	*14*	5.1 U	5.6 U	5.1 U	5.1 U	5.1 U
Phenanthrene	---	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
Pyrene	*180*	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U
1,2,4-Trichlorobenzene	**70**	2.0 U	2.2 U	2.0 U	2.0 U	2.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded

U - compound was analyzed for, but not detected at the concentration shown.
J - estimated concentration.
--- not available.
Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-6
Metal Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	B-1	B-2	B-9	B-11	B-15	B-16	EB-101	MP-1	MP-5A	MP-5B2	MP-9
Lab ID	or RBSL[1]	N50984-6A	N50401-15A	N50984-2A	N50984-8A	N50984-12A	N50984-11A	N50401-16A	N50401-13A	N50200-9	N50200-8	N50984-4A
Sample Date		15-Oct-03	8-Oct-03	15-Oct-03	16-Oct-03	16-Oct-03	16-Oct-03	8-Oct-03	8-Oct-03	7-Oct-03	7-Oct-03	15-Oct-03
Reporting units are in ug/l		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Antimony	**6**	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U
Arsenic	**10**	4.1 U	7.6 BJ	4.1 U	36.9 J	4.8 BJ	4.1 U	4.1 U	4.6 BJ	4.1 U	20.2 J	4.1 U
Barium	**2000**	449	724	163 B	426	69.4 B	136 B	184 B	343	70.2 B	231	274
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.92 BJ	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Cadmium	**5**	0.40 U	2.6 BJ	0.40 U	1.0 BJ	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	2.3 B	0.40 U
Chromium	**100**	0.80 U	1.9 BJ	0.80 U	139	0.80 U	0.80 U	0.80 U	0.80 U	3.1 B	38.5	0.80 U
Cobalt	*730*	0.70 U	0.70 U	0.70 U	86.2 J	0.70 U	0.70 U	1.4 B	71.3	10.7 B	11.6 B	20.2 BJ
Lead	**15**	2.2 U	6.3 J	2.2 U	67.8 J	2.2 U	2.2 U	2.2 U	3.0 BJ	4.2 J	3.7 J	2.2 U
Mercury	**2**	0.18 U	0.04 U	0.18 U	0.82 B	0.18 U	0.18 U	0.04 U	0.04 U	0.10 UJ	0.15 UJ	0.18 U
Nickel	*730*	2.8 U	2.8 U	2.8 U	90.7 J	4.7 BJ	3.1 BJ	2.9 BJ	9.5 BJ	9.0 B	18.3 B	5.7 BJ
Selenium	**50**	4.4 U	4.4 U	4.4 U	7.2	4.4 U	4.4 U	4.4 U	4.4 U	4.4 UJ	4.4 UJ	4.4 U
Vanadium	*260*	0.60 U	1.8 B	5.5 B	492	1.0 B	0.60 U	0.60 U	0.95 B	0.63 B	68.7	0.60 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

NA - not analyzed.

Note 1: MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-6
Metal Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP

Sample ID	MCL	MP-9D	MP-10	MW-13A	MW-13B2	MW-13B2D	MW-15A	MW-15B2	MW-16A	MW-16B2	MW-16B2D	MW-20B
Lab ID	or RBSL[1]	N50984-5A	N50984-3A	N50200-14	N50200-12	N50200-13	N50401-11A	N50401-12A	N50401-7A	N50401-5A	N50401-6A	N50401-8A
Sample Date		15-Oct-03	15-Oct-03	6-Oct-03	6-Oct-03	6-Oct-03	8-Oct-03	8-Oct-03	9-Oct-03	9-Oct-03	9-Oct-03	8-Oct-03
Reporting units are in ug/l		Total (duplicate)	Total	Total	Total	Total (duplicate)	Total	Total	Total	Total	Total (duplicate)	Total
Antimony	**6**	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.90 U	4.90 U	NA
Arsenic	**10**	4.1 U	4.1 U	**10.7** J	**26.7** J	**26.2** J	4.1 U	**15.2** J	4.1 U	**22.4** J	**17.9** J	NA
Barium	**2000**	283	121 B	336	504	498	59.6 B	640	111 B	612	602	NA
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA
Cadmium	**5**	0.65 BJ	0.40 U	0.81 B	0.40 U	0.40 U	0.40 U	0.40 U	2.6 BJ	0.40 U	0.40 U	NA
Chromium	**100**	0.80 U	0.80 U	0.80 U	8.4 B	0.80 U	0.80 U	2.6 BJ	0.80 U	1.8 BJ	0.80 U	NA
Cobalt	*730*	20.4 BJ	32.4 BJ	10.7 B	0.88 B	0.80 B	83.7	1.5 B	7.5 B	2.8 B	1.3 B	NA
Lead	**15**	2.2 U	3.0 BJ	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Mercury	**2**	0.18 U	0.18 U	0.08 UJ	0.08 UJ	0.09 UJ	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 B
Nickel	*730*	5.5 BJ	18.4 BJ	6.5 B	9.5 BJ	5.2 BJ	10.5 BJ	9.4 BJ	3.7 BJ	13.1 BJ	10.7 BJ	NA
Selenium	**50**	4.4 U	4.4 U	4.4 UJ	4.4 UJ	4.4 UJ	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	NA
Vanadium	*260*	0.60 U	3.4 B	0.60 U	0.80 B	0.60 U	1.6 B	0.74 B	0.60 U	3.2 B	0.89 B	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

NA - not analyzed.

Note 1 MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-6
Metal Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 3 of 5)

Sample ID	MCL	MW-21B	MW-30A(2)	MW-41A	MW-59A	MW-61A	MW-72A	MW-75B	MW-76A	MW-76B2	MW-78B	MW-82A
Lab ID	or RBSL[1]	N50401-9A	N50720-11A	N50720-5A	N50720-6A	N50401-17A	N50401-4A	N50200-15	N50200-7	N50200-6	N50401-10A	N50720-9A
Sample Date		8-Oct-03	14-Oct-03	13-Oct-03	13-Oct-03	9-Oct-03	9-Oct-03	6-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03
Reporting units are in ug l		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Antimony	**6**	NA	4.9 U	NA	NA	4.9 U	4.9 U	NA	4.9 U	4.9 U	NA	NA
Arsenic	**10**	NA	**33.5** J	6.1 BJ	5.9 BJ	6.6 BJ	4.1 U	NA	4.8 BJ	4.1 U	NA	6.2 BJ
Barium	**2000**	NA	600	NA	NA	132 B	77.9 B	NA	79.7 B	463	NA	NA
Beryllium	**4**	NA	0.20 U	NA	NA	0.20 U	0.20 U	NA	0.20 U	0.20 U	NA	NA
Cadmium	**5**	NA	..3 BJ	NA	NA	1.4 BJ	0.40 U	NA	0.40 U	0.56 B	NA	NA
Chromium	**100**	NA	0.85 BJ	0.80 U	0.80 U	0.80 U	1.6 B	NA	2.8 B	1.2 B	NA	0.80 U
Cobalt	*730*	NA	4.5 B	NA	NA	0.70 U	3.0 B	NA	23.0 B	5.7 B	NA	NA
Lead	**15**	2.2 U	2.8 B	NA	NA	2.2 U	2.2 U	2.2 U	2.8 BJ	2.2 U	2.2 U	NA
Mercury	**2**	3.4	0.18 U	NA	NA	0.04 U	0.04 U	0.24 U	0.10 UJ	0.44 U	2.3	NA
Nickel	*730*	NA	5.6 BJ	NA	NA	5.1 BJ	2.5 U	NA	17.9 B	25.2 B	NA	NA
Selenium	**50**	NA	4.4 U	NA	NA	4.4 U	4.4 U	NA	4.4 UJ	4.4 UJ	NA	NA
Vanadium	*260*	NA	0.60 U	NA	NA	0.60 U	3.7 B	NA	3.7 B	4.6 B	NA	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
NA - not analyzed.
Note 1: MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics

TABLE 5-6
Metal Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 4 of 5)

Sample ID	MCL	MW-83A	MW-83B1	MW-83B2	MW-84A	MW-84B2	MW-85A	MW-85B2	MW-86A	MW-87A	MW-88A	MW-89A
Lab ID	or RBSL[1]	N50200-3	N50200-1	N50200-2	N50200-17	N50200-16	N50200-5	N50200-4	N50401-14A	N50720-14A	N50720-4A	N50401-23A
Sample Date		7-Oct-03	7-Oct-03	7-Oct-03	6-Oct-03	6-Oct-03	7-Oct-03	7-Oct-03	8-Oct-03	14-Oct-03	13-Oct-03	10-Oct-03
Reporting units are in ug/l		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Antimony	**6**	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	4.9 U	NA	NA	NA
Arsenic	**10**	5.0 BJ	4.1 U	4.1 U	8.7 BJ	4.1 U	4.1 U	**53.0** J	4.1 U	4.1 U	4.1 U	**11.4** J
Barium	**2000**	27.6 B	67.2 B	161 B	900	194 B	168 B	580	1180	NA	NA	NA
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	NA	NA	NA
Cadmium	**5**	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	6.8 J	NA	NA	NA
Chromium	**100**	12.9	0.80 U	6.7 B	0.80 U	0.80 U	0.80 U	1.0 B	0.80 U	15.3 J	0.80 U	0.80 U
Cobalt	*730*	0.70 U	1.1 B	2.8 B	53.6	1.4 B	1.7 B	1.1 B	223	NA	NA	NA
Lead	**15**	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	3.4 J	NA	NA	NA
Mercury	**2**	0.10 UJ	0.10 UJ	0.12 UJ	0.07 UJ	0.12 UJ	0.11 UJ	0.10 UJ	0.04 U	NA	NA	NA
Nickel	*730*	8.2 B	2.8 U	6.6 B	17.5 B	3.2 B	3.9 B	3.3 B	63.3 J	NA	NA	NA
Selenium	**50**	4.4 UJ	4.4 UJ	4.4 UJ	4.4 UJ	4.4 UJ	4.4 UJ	4.4 UJ	4.4 U	4.4 U	4.4 U	4.4 U
Vanadium	*260*	5.6 B	1.9 B	7.1 B	0.60 U	0.60 U	0.60 U	1.1 B	2.8 B	NA	NA	NA

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.

J - estimated concentration.

B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

NA - not analyzed.

Note 1. MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-6
Metal Concentrations in Groundwater - Second Round
Caribbean Petroleum Refining, LP
(Page 5 of 5)

Sample ID	MCL	MW-90A	MW-91A	MW-92A	MW-93A	MW-94A	MW-95A	MW-96A	MW-97A	MW-TB2	MW-TB3	MW-TB3D
Lab ID	or RBSL[1]	N50401-21A	N50401-18A	N50720-3A	N50984-9A	N50720-2A	N50984-10A	N50401-20A	N50401-22A	N50401-3AR	N50720-7A	N50720-8A
Sample Date		10-Oct-03	9-Oct-03	13-Oct-03	16-Oct-03	13-Oct-03	16-Oct-03	10-Oct-03	10-Oct-03	10-Oct-03	14-Oct-03	14-Oct-03
Reporting units are in ug/l		Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total - Duplicate
Antimony	**6**	NA	NA	NA	NA	NA	NA	NA	NA	4.9 U	4.9 U	4.9 U
Arsenic	**10**	5.4 BJ	**24.4**	5.7 BJ	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	**31.7**	4.1 U	4.1 U
Barium	**2000**	NA	NA	NA	NA	NA	NA	NA	NA	731	83.9 B	83.7 B
Beryllium	**4**	NA	NA	NA	NA	NA	NA	NA	NA	0.20 U	0.20 U	0.20 U
Cadmium	**5**	NA	NA	NA	NA	NA	NA	NA	NA	0.40 U	0.40 U	0.40 U
Chromium	**100**	0.80 U	11.6	NA	NA	NA	NA	NA	NA	0.80 U	0.80 U	0.80 U
Cobalt	*730*	NA	NA	NA	NA	NA	NA	NA	NA	0.89 B	0.70 U	0.70 U
Lead	**15**	NA	NA	NA	NA	NA	NA	NA	NA	2.2 UJ	2.2 U	2.2 U
Mercury	**2**	NA	NA	NA	NA	NA	NA	NA	NA	0.07 U	0.18 U	0.18 U
Nickel	*730*	NA	NA	NA	NA	NA	NA	NA	NA	17.0 B	6.8 BJ	7.1 BJ
Selenium	**50**	4.4 U	4.4 U	NA	NA	NA	NA	NA	NA	4.4 U	4.4 U	4.4 U
Vanadium	*260*	NA	NA	NA	NA	NA	NA	NA	NA	0.6 U	1.2 B	0.86 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
NA - not analyzed.
Note 1: MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-7
Direct-Push Groundwater Sampling Results - VOCs
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 1)

Sample ID	MCL	PS-15G	PS-16G	PS-22G	PS-22GD	PS-28G	PS-29G	11-2G	11-11G	11-13G	34-6G	34-7G	34-8G
Lab ID	or RBSL[1]	N44262-9B	N44552-6B	N44262-7B	N44262-8B	N43857-2	N43857-1	N44262-12B	N44262-11B	N44262-10B	N44262-1B	N44262-2B	N44087-2A
Sample Date		22-Jul-03	23-Jul-03	22-Jul-03	22-Jul-03	16-Jul-03	16-Jul-03	22-Jul-03	22-Jul-03	22-Jul-03	21-Jul-03	21-Jul-03	17-Jul-03
Reporting units are in ug/l					Duplicate								
Acetone	*610*	75.0 J	16.8 J	24.5 J	10.0 UJ	60.3 J	22.0 J	6.0 J	10 UJ	7.8 J	7.5 J	15.0 J	19.8 J
Benzene	**5**	309	2.5 U	1.0 U	0.36 J	2.5 U	1.3	6.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromodichloromethane	**80**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	**80**	4.0 U	10.0 U	4.0 U	4.0 U	10.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Bromomethane	*8.5*	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	*1900*	32.3	25.0 U	10.0 U	10.0 U	12.2 J	7.7 J	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Carbon disulfide	*1000*	2.6 J	5.0 U	0.85 J	5.0 J	5.0 U	0.48 J	2.6 J	2.0 U	2.0 U	2.0 U	2.0 U	2.0
Carbon tetrachloride	**5**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
Chlorobenzene	**100**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.1	1.0 U	1.0 U	0.26 J	1.0 U	1.0 U	1.0 U
Chloroethane	*3.6*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	**80**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	*2.1*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	0.45 J	1.0 U	1.0 U	1.0 U	0.56 J	1.0 U
Dibromochloromethane	**80**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	*800*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	**5**	6.9 J	2.5 U	1.0 UJ	1.0 UJ	2.5 U	1.0 UJ	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 UJ
1,1-Dichloroethene	**7**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	**70**	1.0 U	2.3 J	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,2-Dichloroethene	**100**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	**5**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	*0.44*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	*0.44*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	**700**	143	80.7	1.0 U	0.27 J	2.5 U	1.0 U	0.28 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Hexanone	*1500*	5.0 U	13.0 U	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methy tert Butyl Ether (MTBE)	---	1.0 U	2.5 U	1.7	2.6	5.4	53.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone (MIBK)	*140*	12.1	13.0 U	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene Chloride	**5**	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	6.0	2.0 U	2.0 U	2.0 U
Styrene	**100**	5.0 U	13.0 U	5.0 U	5.0 U	13.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	*0.053*	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	**5**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	**1000**	53.1	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	0.42 J	1.0 U	0.33 J	1.0 U
1,1,1-Trichloroethane	**200**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 UJ
1,1,2-Trichloroethane	**5**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	**5**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl chloride	**2**	1.0 U	2.5 U	1.0 U	1.0 U	2.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	**10,000**	633	19.7	0.27 J	0.76 J	2.5 U	0.39 J	1.7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown

J - estimated concentration

-- not available

Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-8
Direct-Push Groundwater Sampling Results - BNAs
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 2)

Sample ID	MCL	PS-15G	PS-16G	PS-22G	PS-22GD	PS-28G	PS-28G	PS-29G	11-2G	11-11G	11-13G	34-6G	34-7G	34-8G
Lab ID	or RBSL[1]	N44262-9B	N44552-6B	N44552-8B	N44552-10B	N43857-2	N43857-3	N43857-1	N44262-12B	N44262-11B	N44262-10B	N44262-1B	N44262-2B	N44087-3A
Sample Date		22-Jul-03	23-Jul-03	23-Jul-03	24-Jul-03	16-Jul-03	16-Jul-03	16-Jul-03	22-Jul-03	22-Jul-03	22-Jul-03	21-Jul-03	21-Jul-03	17-Jul-03
Reporting units are in ug/l					Duplicate		Duplicate							
2-Chlorophenol	*3.0*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
4-Chloro-3-methyl phenol	---	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
2,4-Dichlorophenol	*110*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
2,4-Dimethylphenol	*730*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
2,4-Dinitrophenol	*73*	21 UJ	20 UJ	20 UJ	22 UJ	670 U	120 U	29 U	20 UJ	20 UJ	20 UJ	29 UJ	22 UJ	22 U
4,6-Dinitro-o-cresol	*3.7*	21 UJ	20 UJ	20 UJ	22 UJ	670 U	120 U	29 U	20 UJ	20 UJ	20 UJ	29 UJ	22 UJ	22 U
2-Methylphenol	*1,800*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
3&4-Methylphenol	*180*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
2-Nitrophenol	---	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
4-Nitrophenol	*290*	21 UJ	20 UJ	20 UJ	22 UJ	670 U	120 U	29 U	20 UJ	20 UJ	20 UJ	29 UJ	22 UJ	22 UJ
Pentachlorophenol	1	21 UJ	20 UJ	20 UJ	22 UJ	670 U	120 U	29 U	20 UJ	20 UJ	20 UJ	29 UJ	22 UJ	22 U
Phenol	*11,000*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 UJ
2,4,5-Trichlorophenol	---	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
2,4,6-Trichlorophenol	---	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
Acenaphthene	*370*	2.1 UJ	11.4 J	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.3 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Acenaphthylene	---	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Anthracene	*1,800*	2.1 UJ	1.4 J	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Benzo(a)anthracene	*0.092*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Benzo(a)pyrene	0.2	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	0.61 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Benzo(b)fluoranthene	*0.092*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Benzo(ghi)perylene	---	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Benzo(k)fluoranthene	*0.92*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
4-Bromophenyl phenyl ether	---	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Butyl benzyl phthalate	*7,300*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	1.0 J	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
2-Chloronaphthalene	*490*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
4-Chloroaniline	*150*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
Carbazole	*3.3*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	3.1 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Chrysene	*9.2*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	46.2 J	5.5 J	2.9 U	2.9 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	0.82 J
bis(2-Chloroethoxy)methane	---	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
bis(2-Chloroethyl) ether	*0.0096*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
bis(2-Chloroisopropyl)ether	*0.26*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
4-Chlorophenyl phenyl ether	---	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
1,2-Dichlorobenzene	600	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
1,3-Dichlorobenzene	*180*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
1,4-Dichlorobenzene	75	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
2,4-Dinitrotoluene	*73*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
2,6-Dinitrotoluene	*37*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
3,3'-Dichlorobenzidine	*0.15*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 R	29 R	7.1 R	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U

TABLE 5-8
Direct-Push Groundwater Sampling Results - BNAs
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 2 of 2)

Sample ID	MCL	PS-15G	PS-16G	PS-22G	PS-22GD	PS-28G	PS-28G	PS-29G	11-2G	11-11G	11-13G	34-6G	34-7G	34-8G
Lab ID	or RBSL[1]	N44262-9B	N44552-6B	N44552-8B	N44552-10B	N43857-2	N43857-3	N43857-1	N44262-12B	N44262-11B	N44262-10B	N44262-1B	N44262-2B	N44087-3A
Sample Date		22-Jul-03	23-Jul-03	23-Jul-03	24-Jul-03	16-Jul-03	16-Jul-03	16-Jul-03	22-Jul-03	22-Jul-03	22-Jul-03	21-Jul-03	21-Jul-03	17-Jul-03
Reporting units are in ug/l					Duplicate		Duplicate							
Dibenzo(a,h)anthracene	*0.0092*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Dibenzofuran	*24*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	0.80 J	7.1 UJ	5.6 UJ	5.5 U
Di-n-butyl phthalate	*3,700*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Di-n-octyl phthalate	*730*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Diethyl phthalate	*29,000*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	1.4 J
Dimethyl phthalate	*370,000*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
bis(2-Ethylhexyl)phthalate	**6**	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	20.8	2.0 UJ	2.0 UJ	2.0 UJ	2.9 J	2.2 UJ	2.2 U
Fluoranthene	*1,500*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Fluorene	*240*	2.1 UJ	14.0 J	2.0 UJ	2.2 UJ	855 J	105	2.9 U	5.4 J	2.0 UJ	0.57 J	2.9 UJ	2.2 UJ	2.2 U
Hexachlorobenzene	**1**	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Hexachlorobutadiene	*0.86*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Hexachlorocyclopentadiene	**50**	21 UJ	20 UJ	20 UJ	22 UJ	670 U	120 U	29 U	20 UJ	20 UJ	20 UJ	29 UJ	22 UJ	22 U
Hexachloroethane	*4.8*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
Indeno(1,2,3-c,d)pyrene	*0.092*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Isophorone	*70*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
2-Methylnaphthalene	*120*	13.5 J	511 J	2.0 UJ	2.2 UJ	6100 J	766 J	122	7.6 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
2-Nitroaniline	---	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
3-Nitroaniline	*3.3*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
4-Nitroaniline	*3.3*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
Naphthalene	*6.5*	18.1 J	358 J	2.0 UJ	2.2 UJ	67 U	12 U	81.7	5.7 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Nitrobenzene	*3.5*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
N-Nitrosodi-n-propylamine	*0.0096*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
N-Nitrosodiphenylamine	*14*	5.3 UJ	5.0 UJ	5.0 UJ	5.6 UJ	170 U	29 U	7.1 U	5.0 UJ	5.0 UJ	5.0 UJ	7.1 UJ	5.6 UJ	5.5 U
Phenanthrene	---	2.1 UJ	17.2 J	2.0 UJ	2.2 UJ	828 J	92.0 J	4.9	26.4 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U
Pyrene	*180*	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	162 J	14.0 J	2.9 U	4.9 J	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	1.3 J
1,2,4-Trichlorobenzene	**70**	2.1 UJ	2.0 UJ	2.0 UJ	2.2 UJ	67 U	12 U	2.9 U	2.0 UJ	2.0 UJ	2.0 UJ	2.9 UJ	2.2 UJ	2.2 U

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for, but not detected at the concentration shown.
J - estimated concentration.
--- not available
R - rejected based on data validation.
Note 1: EPA Maximum Contaminant Levels (MCLs) are shown in bold. For compounds without MCLS, EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-9
Direct-Push Groundwater Sampling Results - Metals
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 3)

Sample ID	MCL	PS-15G	PS-15G	PS-16G	PS-16G	PS-22G	PS-22GD	PS-22G	PS-22GD	PS-28G
Lab ID	or RBSL[1]	N44552-5	N44676-4	N44552-6	N44552-6A	N44676-2	N44676-3	N44676-7	N44676-8	N44087-6
Sample Date		23-Jul-03	25-Jul-03	23-Jul-03	23-Jul-03	25-Jul-03	25-Jul-03	26-Jul-03	26-Jul-03	17-Jul-03
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total	Total (dupl.)	Dissolved	Dissolved (dupl.)	Total
Antimony	**6**	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	7.0 U
Arsenic	**10**	14.4	3.3 U	30.0	3.3 U	3.6 BJ	8.2 BJ	3.3 U	3.3 U	55.4
Barium	**2000**	690	312	489	1.5 B	294 J	545 J	279	254	3590
Beryllium	**4**	1.1 B	0.20 U	0.79 B	0.20 U	0.20 U	0.97 B	0.20 U	0.20 U	10.4
Cadmium	**5**	0.40 U	0.40 U	1.7 B	0.40 U	0.40 U	1.0 B	0.40 U	0.40 U	0.80 U
Chromium	**100**	51.8	0.60 U	37.2	0.60 U	21.6 J	90.2 J	0.60 U	0.60 U	1130
Cobalt	*730*	43.8 B	18.1 BJ	7.4 B	0.70 U	35.8 B	72.9	23.5 BJ	32.0 BJ	160
Lead	**15**	17.0	2.2 U	2.7 BJ	2.2 U	3.6 J	9.4 J	2.2 U	2.2 U	170
Mercury	**2**	0.10 UJ	0.10 UJ	0.12 BJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 UJ
Nickel	*730*	35.0 B	11.4 B	30.8 B	1.9 U	19.1 B	45.6	11.0 B	11.1 B	297 J
Selenium	**50**	3.4 BJ	3.1 U	3.1 UJ	3.1 UJ	3.1 U	3.1 U	3.1 U	3.1 U	29.4 J
Vanadium	*260*	117	0.90 U	79.0	0.90 U	50.4 J	198 J	0.90 U	0.90 U	2850

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1: MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-9
Direct-Push Groundwater Sampling Results - Metals
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 2 of 3)

Sample ID	MCL	PS-28G	PS-29G	PS-29G	11-2G	11-2G	11-11G	11-11G	11-13G	11-13G
Lab ID	or RBSL[1]	N44087-11	N44087-7	N44087-12	N44262-12	N44552-4	N44262-11	N44552-3	N44262-10	N44552-2
Sample Date		18-Jul-03	17-Jul-03	18-Jul-03	22-Jul-03	23-Jul-03	22-Jul-03	23-Jul-03	22-Jul-03	23-Jul-03
Reporting units are in ug/l		Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Antimony	**6**	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Arsenic	**10**	3.3 U	3.3 U	3.3 U	29.3	3.3 U	45.1	3.3 U	37.0	13.2
Barium	**2000**	622	314	287	202	113 B	198 B	233	619	557
Beryllium	**4**	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.67 B	0.20 U	1.1 B	0.20 U
Cadmium	**5**	0.40 U	0.40 U	0.40 U	0.40 U	0.40 U	0.94 B	0.90 B	2.2 B	3.4 B
Chromium	**100**	0.60 U	4.9 B	1.3 B	73.0	0.60 U	67.8	0.60 U	58.9	6.6 B
Cobalt	*730*	1.6 B	2.3 B	1.2 B	35.2 B	37.6 B	75.6	119	85.4	94.0
Lead	**15**	2.2 U	2.6 BJ	2.2 U	6.6	2.2 U	2.2 U	2.2 U	4.4	2.2 U
Mercury	**2**	0.12 BJ	0.10 UJ	0.10 UJ	0.10 UJ	0.10 BJ	0.38 J	0.10 UJ	0.16 BJ	0.10 UJ
Nickel	*730*	3.6 BJ	5.2 BJ	3.5 BJ	19.1 B	10.4 B	84.8	87.6	71.3	58.5
Selenium	**50**	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ
Vanadium	*260*	0.90 U	10.6 B	0.90 U	89.2	0.90 U	119	0.90 U	85.4	4.8 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1 MCLs and EPA action level for lead are shown in bold EPA Region III risk-based screening levels for tap water are shown in italics.

TABLE 5-9
Direct-Push Groundwater Sampling Results - Metals
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 3 of 3)

Sample ID	MCL	34-6G	34-6G	34-7G	34-7G	34-8G	34-8G
Lab ID	or RBSL[1]	N44262-1	N44262-1A	N44262-4	N44262-5	N44087-4	N44087-5
Sample Date		21-Jul-03	21-Jul-03	21-Jul-03	21-Jul-03	17-Jul-03	17-Jul-03
Reporting units are in ug/l		Total	Dissolved	Total	Dissolved	Total	Dissolved
Antimony	**6**	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Arsenic	**10**	10.1	3.8 B	8.9 B	6.0 B	21.7 J	4.2 BJ
Barium	**2000**	1100	847	534	678	329	174 B
Beryllium	**4**	0.35 B	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U
Cadmium	**5**	3.0 B	1.2 B	0.73 B	0.57 B	0.56 B	0.40 U
Chromium	**100**	55.5	0.60 U	7.7 B	0.60 U	104	0.60 U
Cobalt	*730*	31.2 B	63.2	4.3 B	1.8 B	29.3 B	9.3 B
Lead	**15**	13.0	2.2 U	2.2 U	2.2 U	11.6 J	2.2 U
Mercury	**2**	0.43 J	0.10 UJ	0.13 BJ	0.10 UJ	0.10 UJ	0.10 UJ
Nickel	*730*	23.0 B	11.8 B	4.6 B	1.9 U	85.4 J	28.2 BJ
Selenium	**50**	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ	3.1 UJ
Vanadium	*260*	181	8.8 B	18.0 B	0.90 U	671	16.2 B

Any results that exceed MCLs or RBSLs are shown bolded and shaded.

U - compound was analyzed for but not detected at the concentration shown.
J - estimated concentration.
B - concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).
Note 1: MCLs and EPA action level for lead are shown in bold. EPA Region III risk-based screening levels for tap water are shown in italics.

Table 5-10
Soil Sampling Results - TOC, Percent Solids, and Dry Bulk Density
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

Well	MP-5B2	MP-9	MP-10	MW-13A	MW-13A duplicate	MW-13B2	MW-15B2	MW-15B2	MW-15B2	MW-16B2
Sample Date	26-May-03	29-May-03	30-May-03	26-Feb-03	26-Feb-03	27-Feb-03	5-Mar-03	6-Mar-03	6-Mar-03	7-Mar-03
Sample Depth (ft bgl)	54-56	8-10	6-8	10-12	10-12	44-46	10-12	40-42	42-44	10-12
Dry Bulk Density (g/ml)	1.8	1.2	1.3	1.0	1.2	1.5	1.2	1.0	1.4	1.1
Solids (%)	85.9	65.4	73.1	74.6	75.7	75.0	76.5	77.1	72.0	84.7
Total Organic Content (%)	---	---	---	11.5	11.6	1.6	6.0	3.1	4.2	7.6
Total Organic Carbon (mg/kg)	<1200	2350	1760	---	---	---	---	---	---	---

Table 5-10
Soil Sampling Results - TOC, Percent Solids, and Dry Bulk Density
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

Well	MW-16B2	MW-76A	MW-76B2	MW-83A	MW-83B1	MW-83B2	MW-84A	MW-84B2	MW-85A	MW-85B2
Sample Date	7-Mar-03	20-May-03	21-May-03	18-Feb-03	18-Feb-03	19-Feb-03	21-Feb-03	25-Feb-03	3-Mar-03	4-Mar-03
Sample Depth (ft bgl)	46-48	8-10	48-50	6-8	30-32	56-58	10-12	48-50	8-10	48-50
Dry Bulk Density (g/ml)	1.4	1.3	1.8	1.2	1.6	1.3	0.97	1.6	0.83	0.94
Solids (%)	80.4	70.4	82.0	78.7	79.2	80.8	72.8	77.2	75.3	77.1
Total Organic Content (%)	4.0	---	---	9.8	2.4	1.9	12.1	2.1	9.6	3.7
Total Organic Carbon (mg/kg)	---	1570	<1200	---	---	---	---	---	---	---

TABLE 6-1
Scope of Supplemental Work
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP
(Page 1 of 2)

Area	Scope	Objective
Process Sewer Area	• Install three shallow wells - MW-98A, MW-99A, MW-100A. Sample and analyze for VOCs, naphthalene and total and dissolved arsenic and lead. Also analyze MW-98A for BNAs. • Sample existing shallow well MW-69A and analyze for VOCs, naphthalene and total and dissolved arsenic.	Complete delineation of impacted shallow groundwater plume in the southern area of the process sewer.
Old Loading Rack	• Sample existing shallow well B-23 and analyze for VOCs, naphthalene and total and dissolved arsenic.	Complete delineation of impacted shallow groundwater plume in the area.
Wastewater Treatment Plant Area	• Install one shallow well - MW-101A. Sample and analyze for VOCs, BNAs and total and dissolved MSL metals. • Resample existing shallow well B-11 and analyze for total and dissolved MSL metals.	Complete delineation of impacted shallow groundwater plume in the area. Confirm the presence of metals at B-11.
Old Oil Lagoons	• Install two shallow wells - MW-102A, MW-103A. Sample and analyze for VOCs, BNAs and total and dissolved arsenic.	Complete delineation of impacted shallow groundwater plume in the area.
Sulfur Lagoon	• Install one shallow well - MW-104A. Sample and analyze for total and dissolved arsenic, chromium and vanadium.	Confirm the presence of arsenic, chromium and vanadium in shallow groundwater.

Table 5-10
Soil Sampling Results - TOC, Percent Solids, and Dry Bulk Density
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP
(Page 3 of 3)

Well	MW-85B2	MW-86A	MW-87A	MW-88A	MW-90A	MW-90A duplicate
Sample Date	4-Mar-03	27-May-03	4-Jun-03	6-Jun-03	2-Jun-03	2-Jun-03
Sample Depth (ft bgl)	50-52	16-18	14-16	10-11.5	10-12	10-12
Dry Bulk Density (g/ml)	1.4	1.6	1.2	1.0	0.94	0.92
Solids (%)	75.7	80.3	69.1	78.1	73.9	74.5
Total Organic Content (%)	2.9	---	---	---	---	---
Total Organic Carbon (mg/kg)	---	<1200	<1400	<1300	<1400	<1300

Notes:

1. Samples at locations MP-5B2, MP-9, MP-10, MW-76A, MW-76B2, MW-86A, MW-87A, MW-88A, and MW-90A, were analyzed for total organic carbon using SW-846-Method 9060M. Samples at the remaining locations were analyzed for total organic content using ASTM method D2974-88 due to matrix interferences using Method 9060M.

TABLE 6-1
Scope of Supplemental Work
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Area	Scope	Objective
Arsenic plume in carbonate water bearing zone	• Sample existing deep well MW-77B and analyze for total and dissolved arsenic. [In addition, total arsenic analysis of samples from downgradient wells MW-75B, MW-20B, MW-21B, MW-77B and MW-78B will be incorporated into the semiannual groundwater sampling program being implemented at the CPR facility as an Interim Corrective Measure.]	Complete delineation of impacted groundwater in the northwest direction.
Well MW-13A	• Resample shallow well MW-13A and analyze for VOCs and naphthalene.	Confirm the presence of benzene and naphthalene in shallow groundwater.
Well MW-21B	• Resample shallow well MW-21B and analyze for total and dissolved chromium.	Confirm the presence of chromium in deep groundwater.

TABLE 6-2
Schedule for Supplemental Work
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

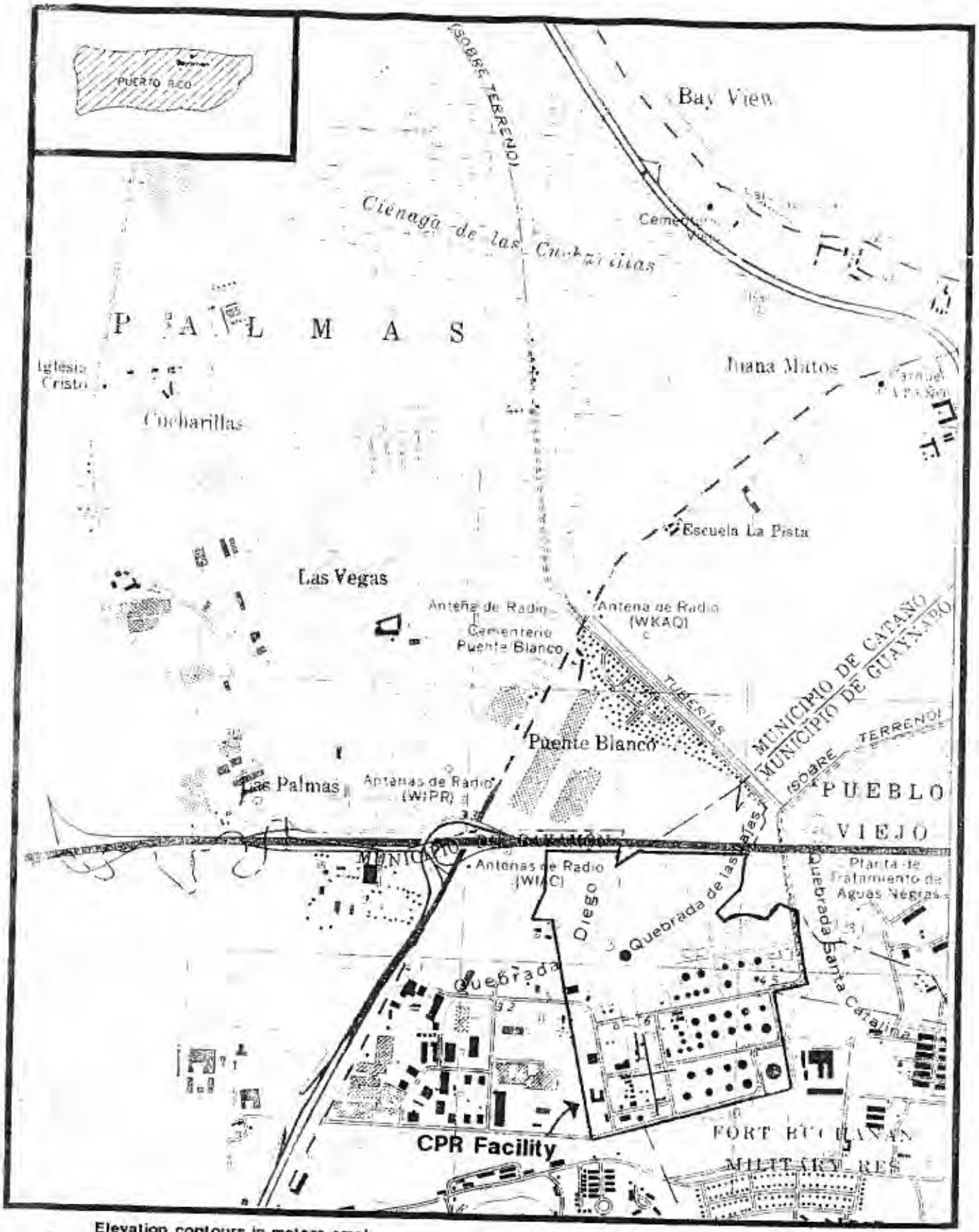
Activity	Start Date	Completion Date
Task 1 • Selection of drilling contractor and laboratory • Permitting • Preparation for field activities (mark-out, utility clearance, etc.)	Upon receipt of EPA approval of Plan	60 days after start date
Task 2 • Monitoring well installation and development	Upon completion of Task 1	30 days after start date
Task 3 • Groundwater sampling • Laboratory analysis • Data validation • Vertical gradient evaluation	Upon completion of Task 2	90 days after start date
Task 4 • Final Report preparation	Upon completion of Task 3	30 days after start date

NOTE: This schedule may be modified based on unforeseen field conditions, delays in securing required permits, unfavorable weather conditions or other problems beyond the control of CPR. In such a case, EPA will be notified immediately and an alternate schedule will be proposed.

TABLE 6-3
Monitoring Well Specifications - Supplemental Sampling
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining LP

Well ID	Construction Date	Elevation of Top of Casing (ft amsl)	Land Surface Elevation (ft amsl)	Well Depth (ft bgl)	TD (ft below TOC)	Casing Diameter (inch)	Casing Length (ft below TOC)	Stick-Up Height (ft agl)	Screen Slot Size (inch)	Screen Length (ft)	Elevation of Top and Bottom of Screen (ft amsl)		Depth to Top and Bottom of Screen (ft bgl)	
											Top	Bottom	Top	Bottom
B-23	25-Jun-03	18.54	15.70	12.2	15.2	1	5.0	3.0	0.010	10	13.5	3.5	2	12
MW-69A	15-Jun-88	18.76	17.01	19.2	21.0	4	5.8	1.8	0.020	15	13.0	-2.0	4	19

Notes:
amsl = above mean sea level
bgl = below ground level
agl = above ground level
TD = Total Well Depth
TOC = Top of Casing
Bottom cup below screen area is 0.2 ft long



Elevation contours in meters amsl

Scale - 1 : 20,000

Figure 2-1

Facility Location

Caribbean Petroleum Refining LP

Bayamon, Puerto Rico

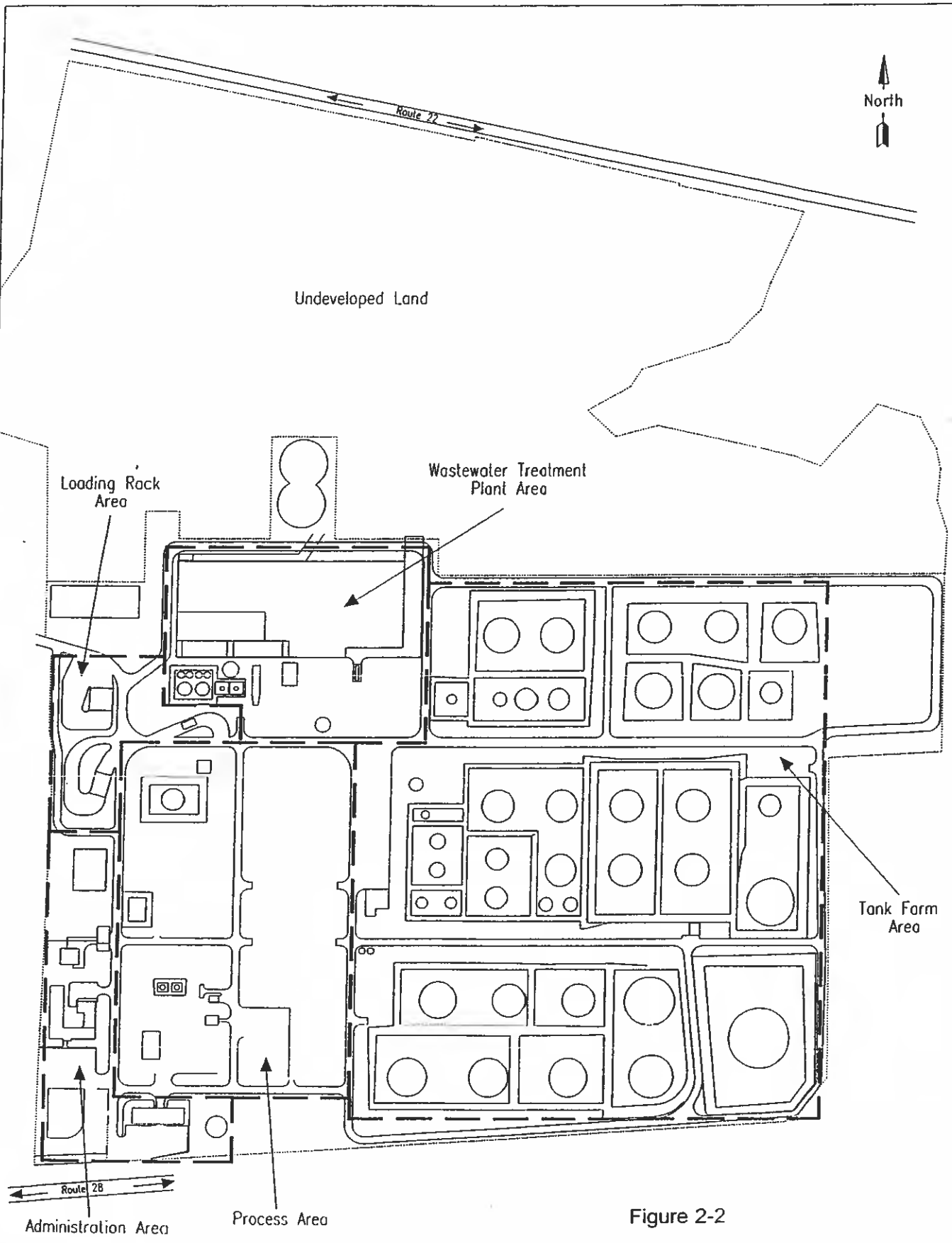


Figure 2-2

Facility Map
Caribbean Petroleum Refining LP
Bayamon, Puerto Rico

North

P.R. Route 22

Las Lajas Creek

Property Boundary

Property Boundary

P.R. Route 28

Outfall 001

Outfall 002

MP-1

MP-5

MP-10

MP-9

AERATION BASIN

FORMER EQUALIZATION BASIN

CPLP WAREHOUSE

Old Loading Rack

Container Storage Area

Refinery Operations Office

Maintenance Building

FIRE HOUSE

Electrical Substation

Service Parking

LAB

OFFICE BUILDING

PARKING AREA

STORAGE BUILDING

MAIN GATE

WAREHOUSE

BOILER AREA

PARKING AREA

GASOLINE/DIESEL LOADING RACK

GUARD HOUSE

COOLING TOWER NO.2

COOLING TOWER NO.1

SULFUR PLANT NO. 2

SULFUR PLANT NO. 1

AMINE UNIT

CONTROL ROOM NO. 2

GULFINER

DEPROPANIZER AND DE-ETHANIZER

PLATFORMING UNIT

NAPHTHA PRETREATER

CRUDE UNIT NO. 2

GASOLINE STABILIZER

CRUDE UNIT NO. 1

VACUUM

POLY UNIT

GAS AND MEROX TREATING

F.C.C. UNIT

GAS CONCENTRATION

CHEMICAL STORAGE

GAUGERS OFFICE

CHARGE PUMP AREA

ASPHALT LAB

CENTRIFUGE

EFF. CONTROL ROOM

A

A'

B

B'

LEGEND

Groundwater Monitoring Location

350 0 350 700

Scale feet

Scale	Date
1/4200	Sep 2003

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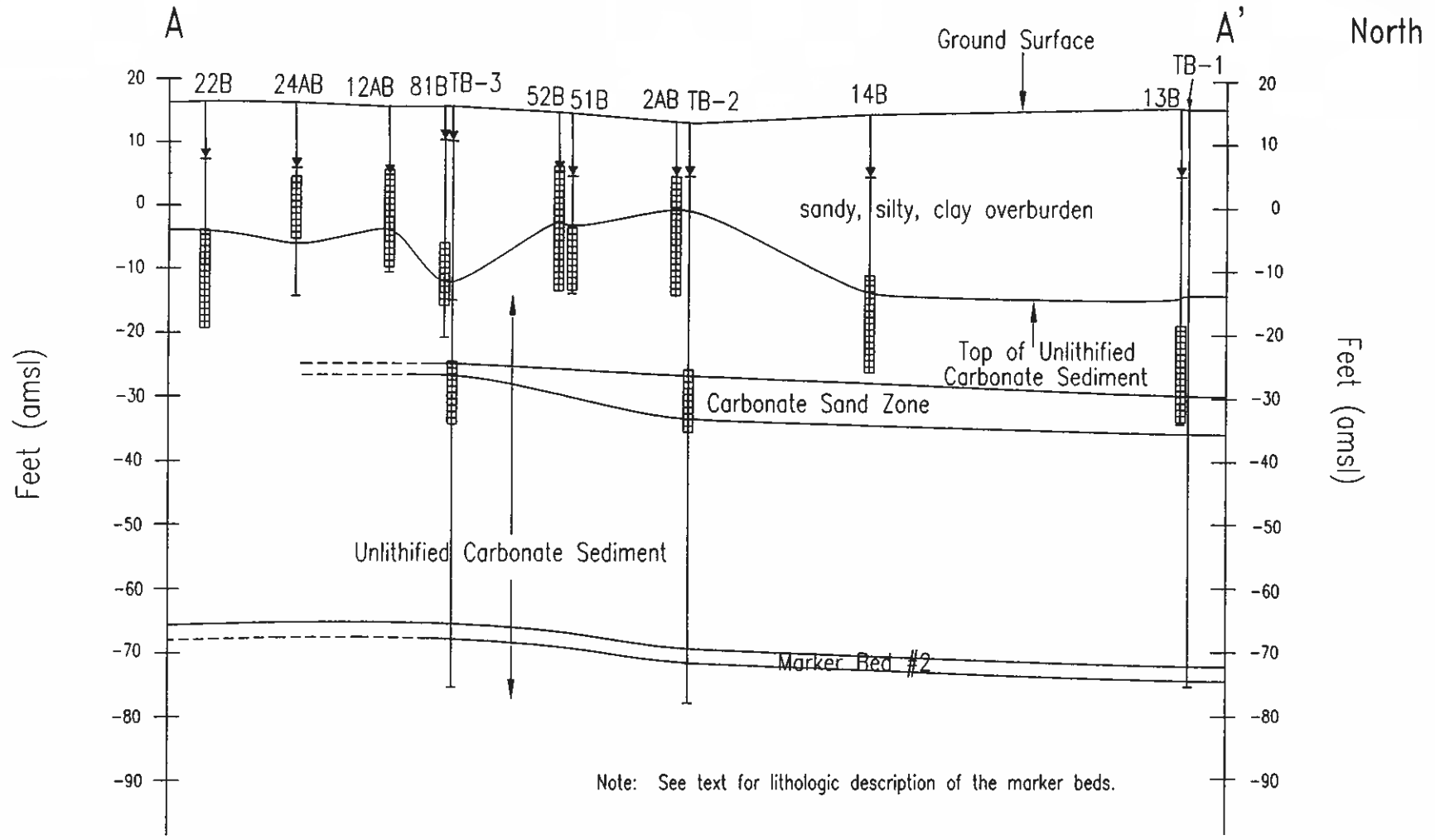
SAN JUAN, PUERTO RICO

Figure 2-3

Location of Geologic Cross-Sections

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico



LEGEND

- Groundwater Elevation from September 2001
- Screened Zone
- Soil Boring Depth Prior to Well Construction

240 0 240 480
Scale feet

Scale	Date
Indicated	Sep 2003

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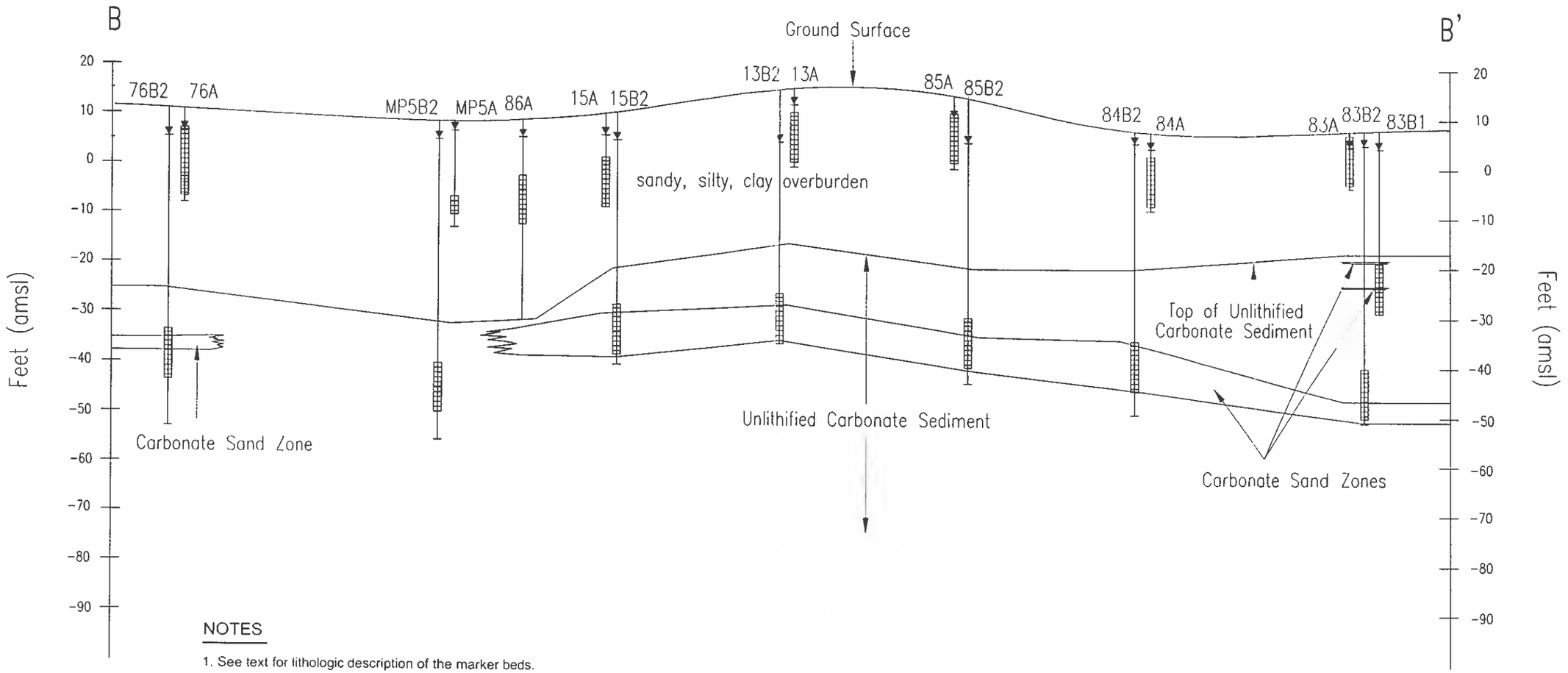
Figure 2-4

Geological Cross-Section A-A'

Caribbean Petroleum Refining LP
Bayamon, Puerto Rico

West

East



NOTES

1. See text for lithologic description of the marker beds.
2. Distances between wells within well clusters are not to scale

LEGEND

- ▼ Groundwater Elevation from September 2003
- Screened Zone
- ⊥ Soil boring depth prior to well construction

480 0 480 960
Scale feet

Scale	Date
Indicated	Jan 2004

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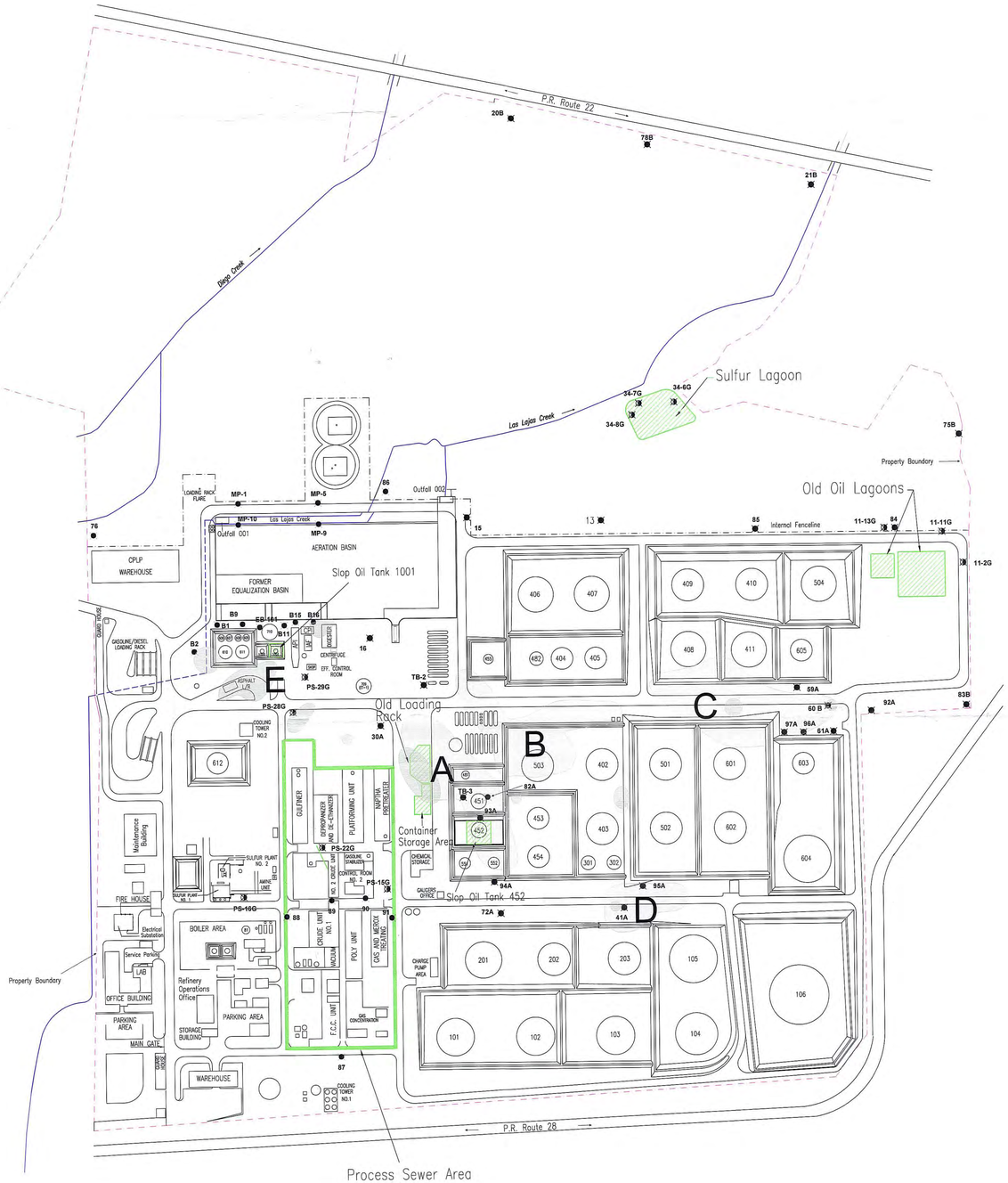
METAIRIE, LOUISIANA
SAN JUAN, PUERTO RICO

Figure 2-5

Geological Cross-Section B-B'

Caribbean Petroleum Refining LP
Bayamon, Puerto Rico

North



LEGEND

- Groundwater monitoring location
- Direct-push groundwater sampling location
- SWMUs/AOCs - Potential Source Areas
- Free phase hydrocarbon plume

500 0 500 1000
Scale feet

Scale	Date
1/2400	Jan 2004

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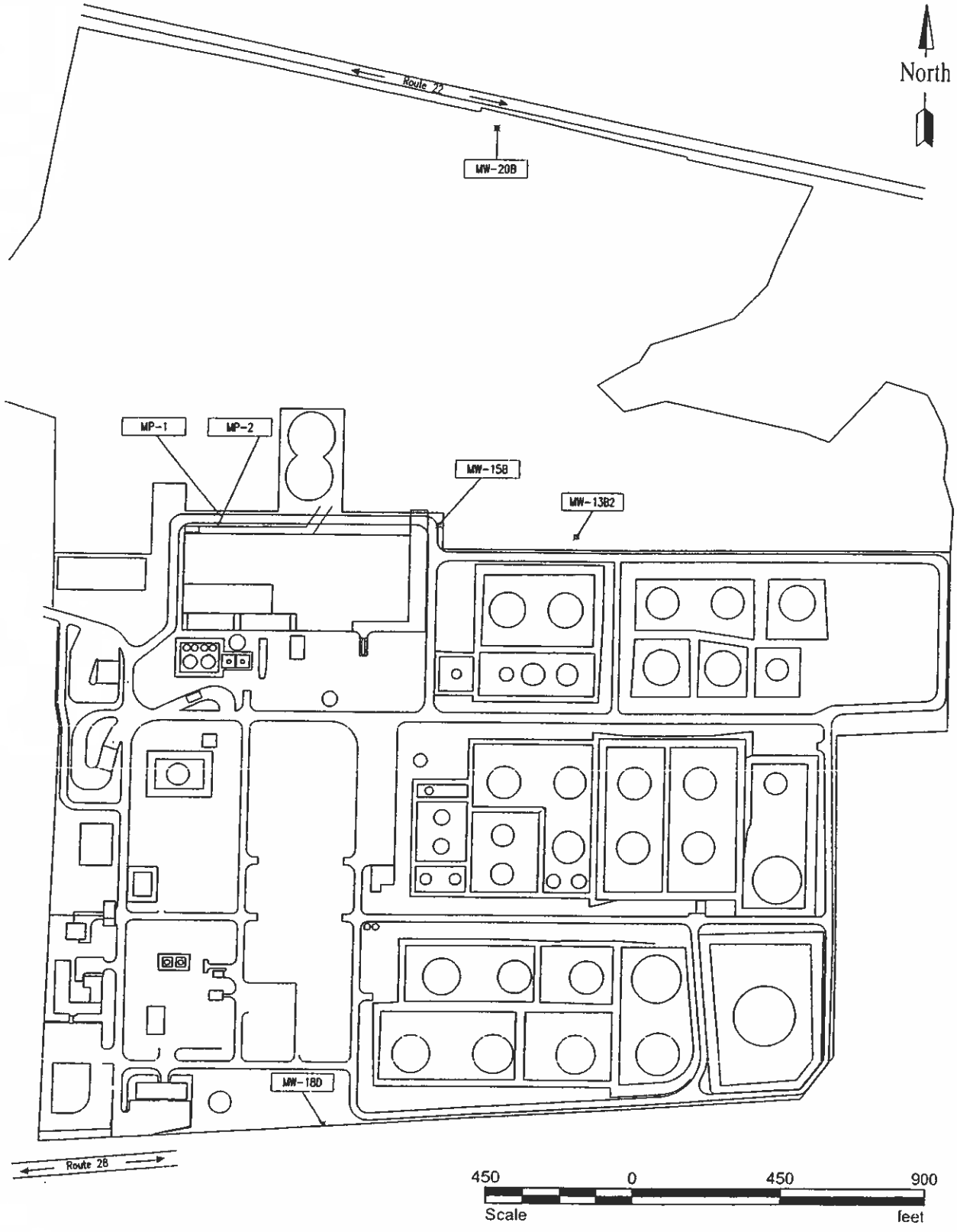
Figure 3-1

Well Network - Potential Source Areas

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico



LEGEND

⊠ MW-15B Tidal Study Well Location

Scale	Date
1/5400	Sep 2003

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Figure 4-1

Location of Tidal Study Wells

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

Figure 4-2A
Tidal Study Results - Well MP-1
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

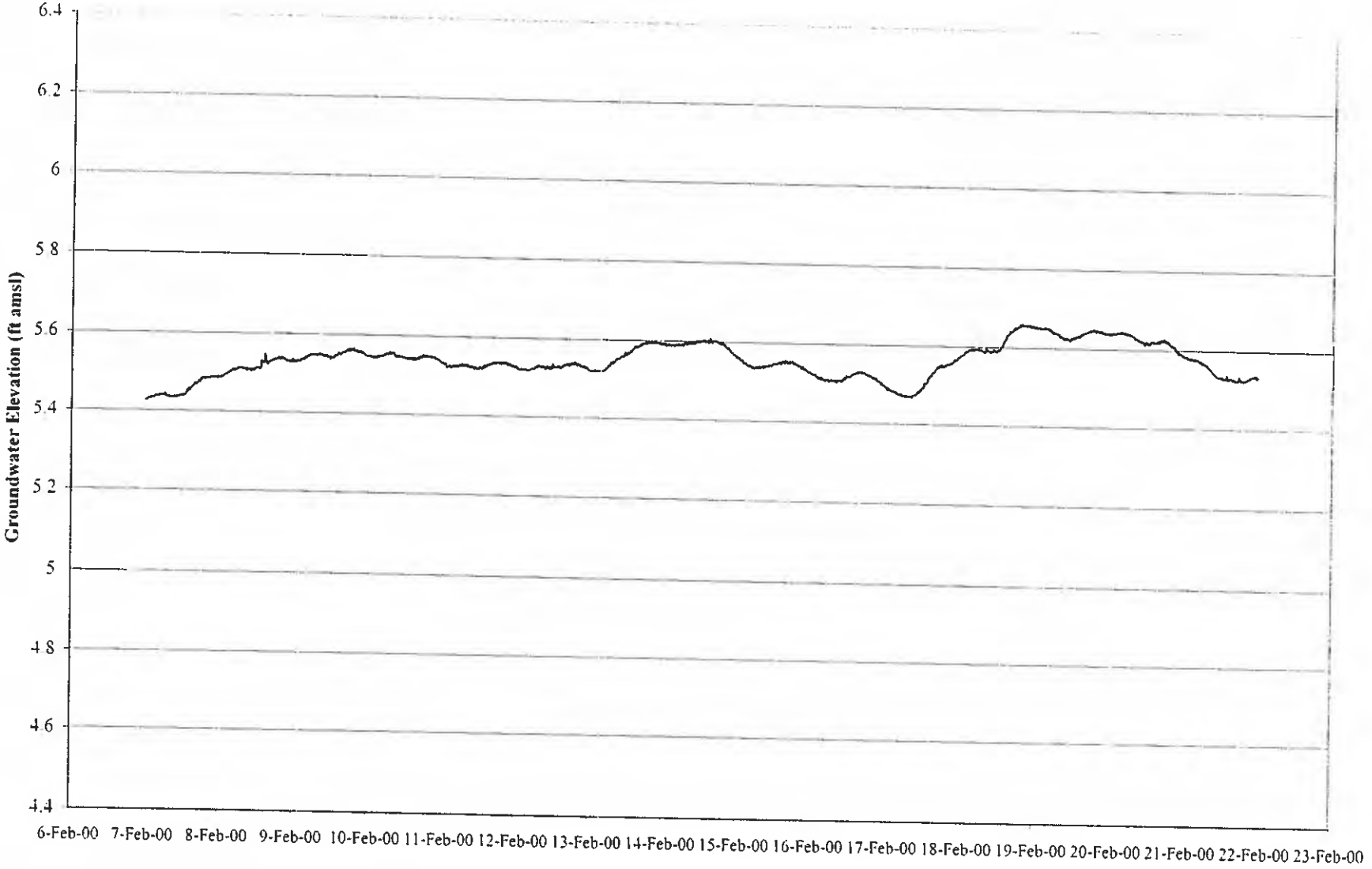


Figure 4-2B
Tidal Study Results, Well MP-2
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

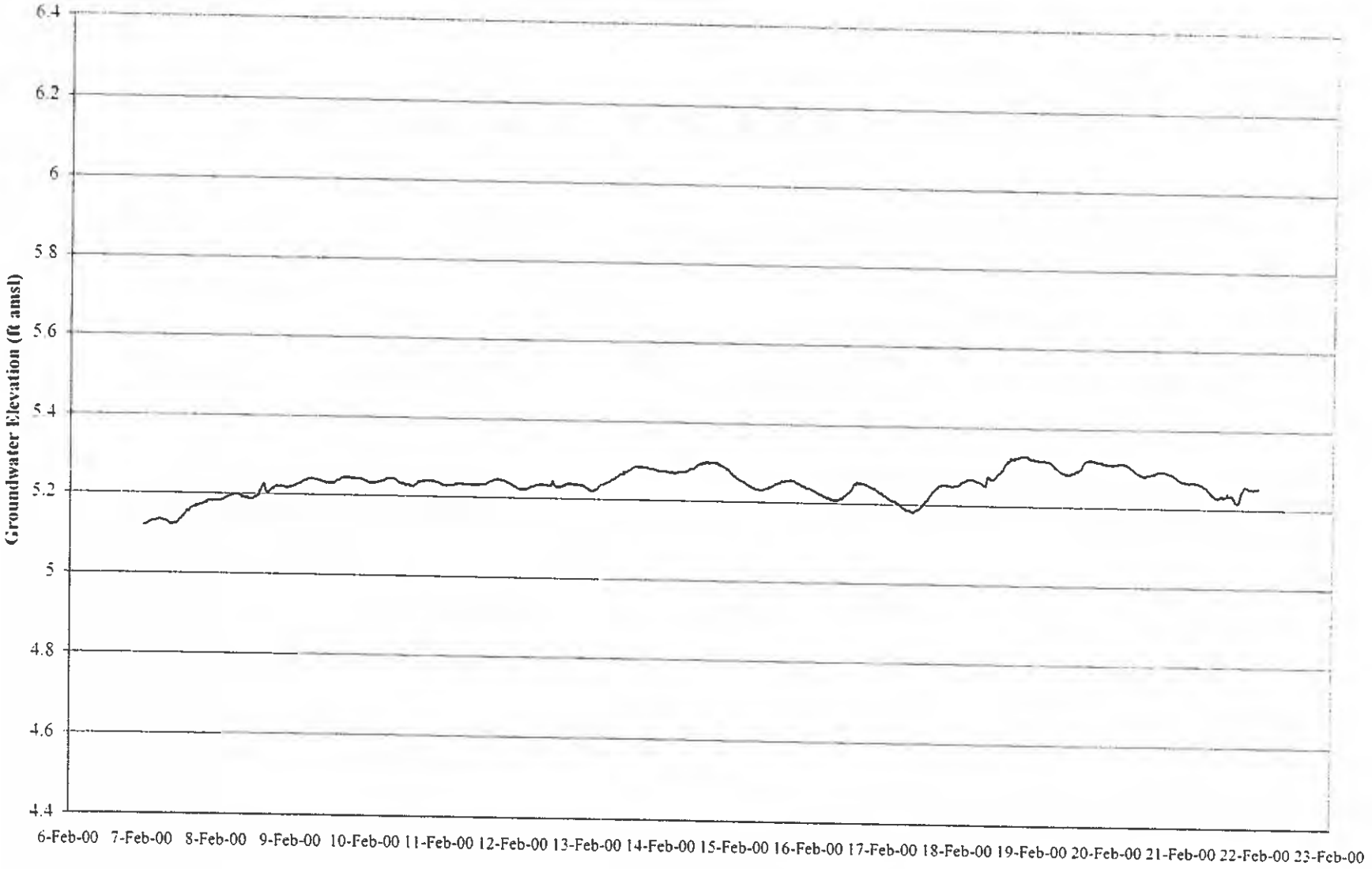


Figure 4-2C
Tidal Study Results, Well MW-13B2
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

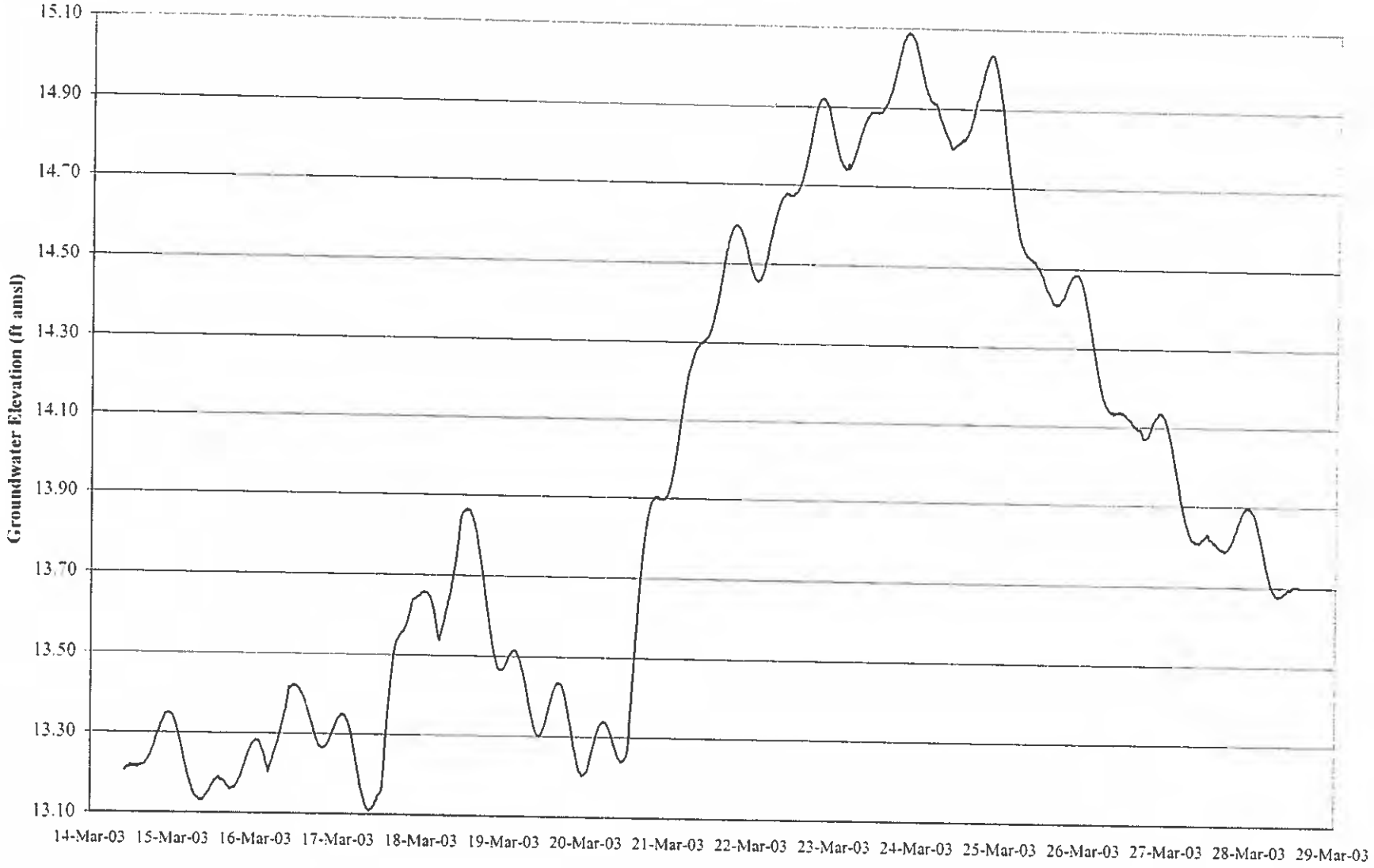


Figure 4-2D
Tidal Study Results, Well MW-15B
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP

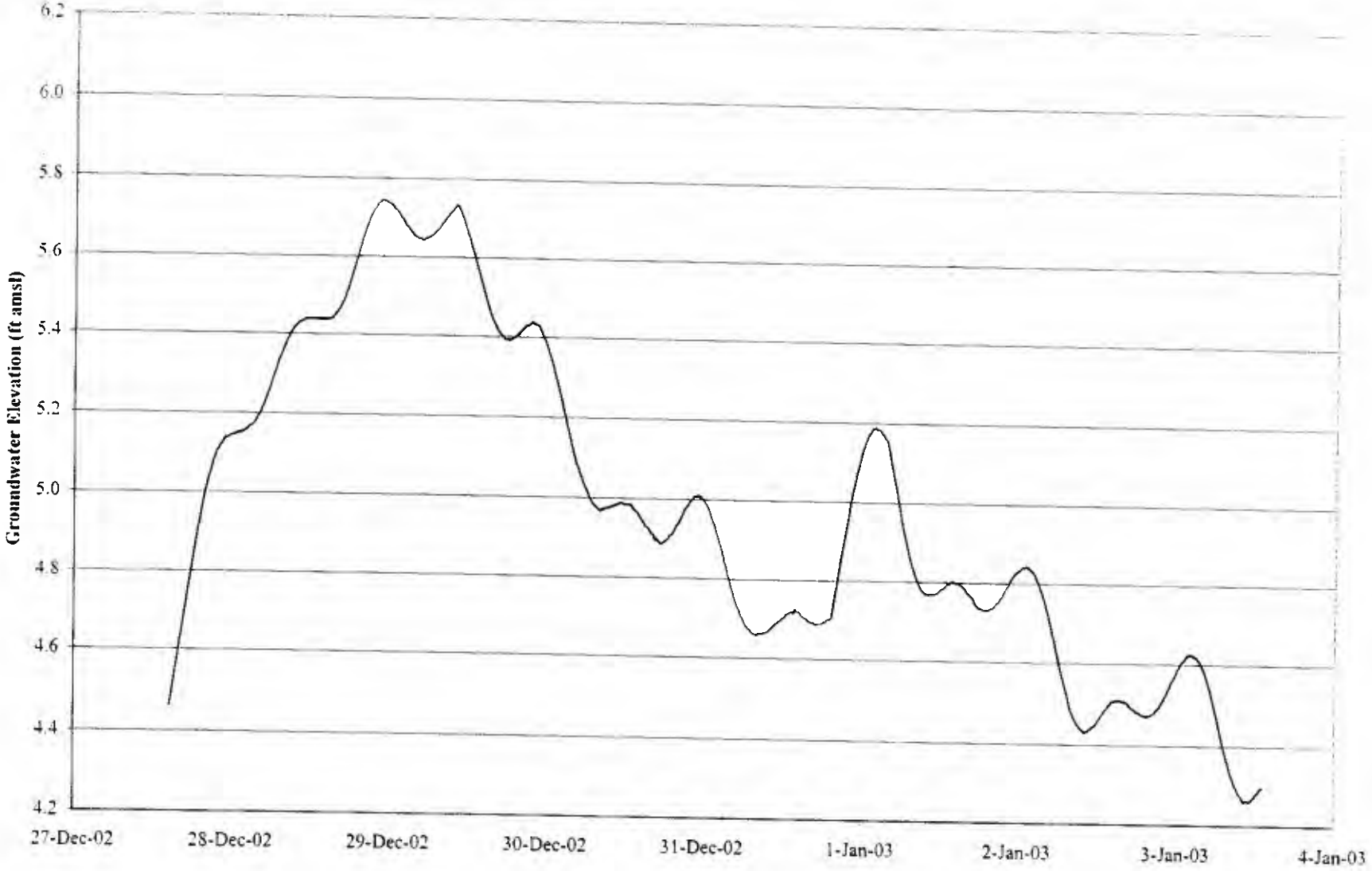
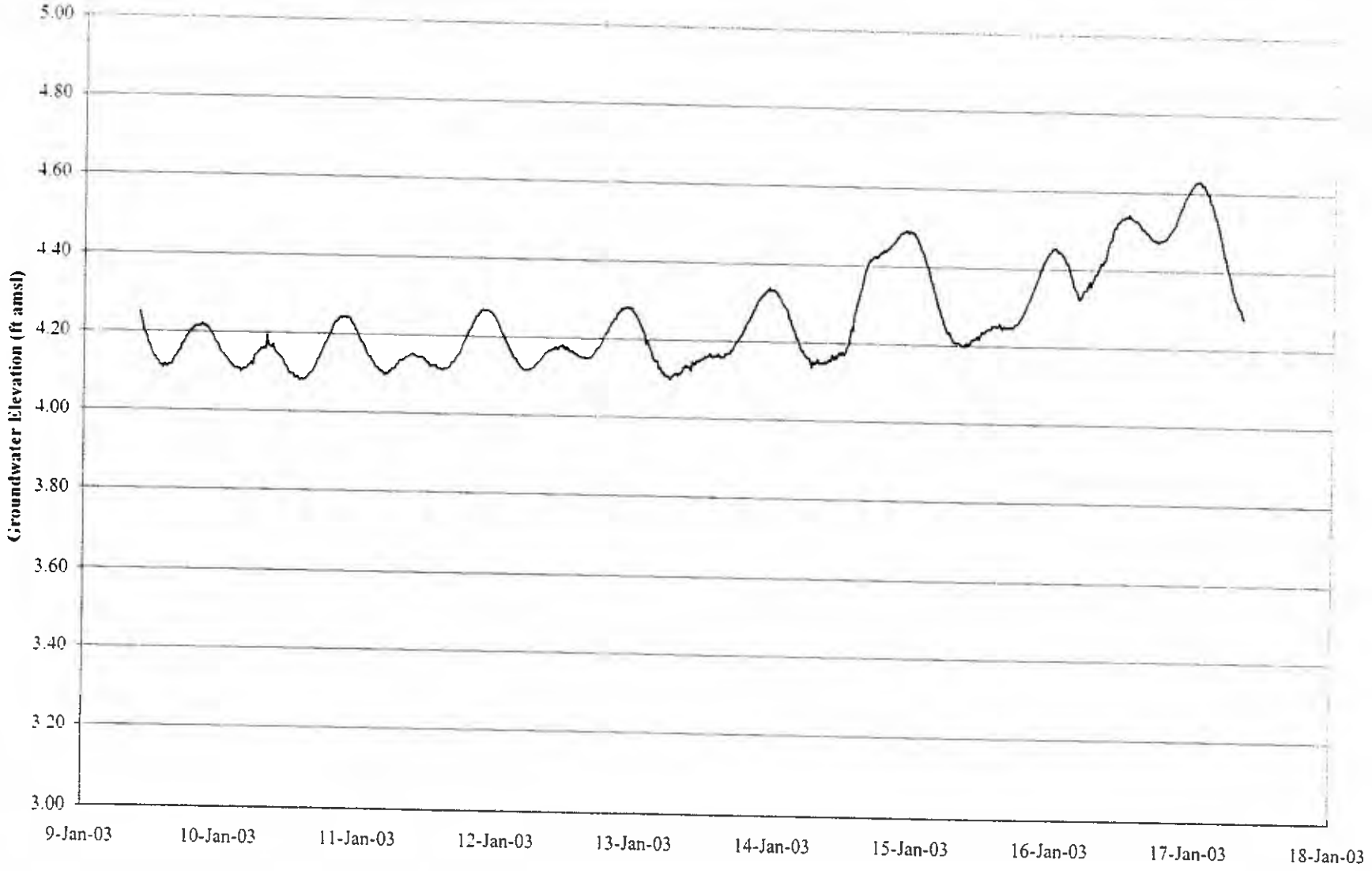
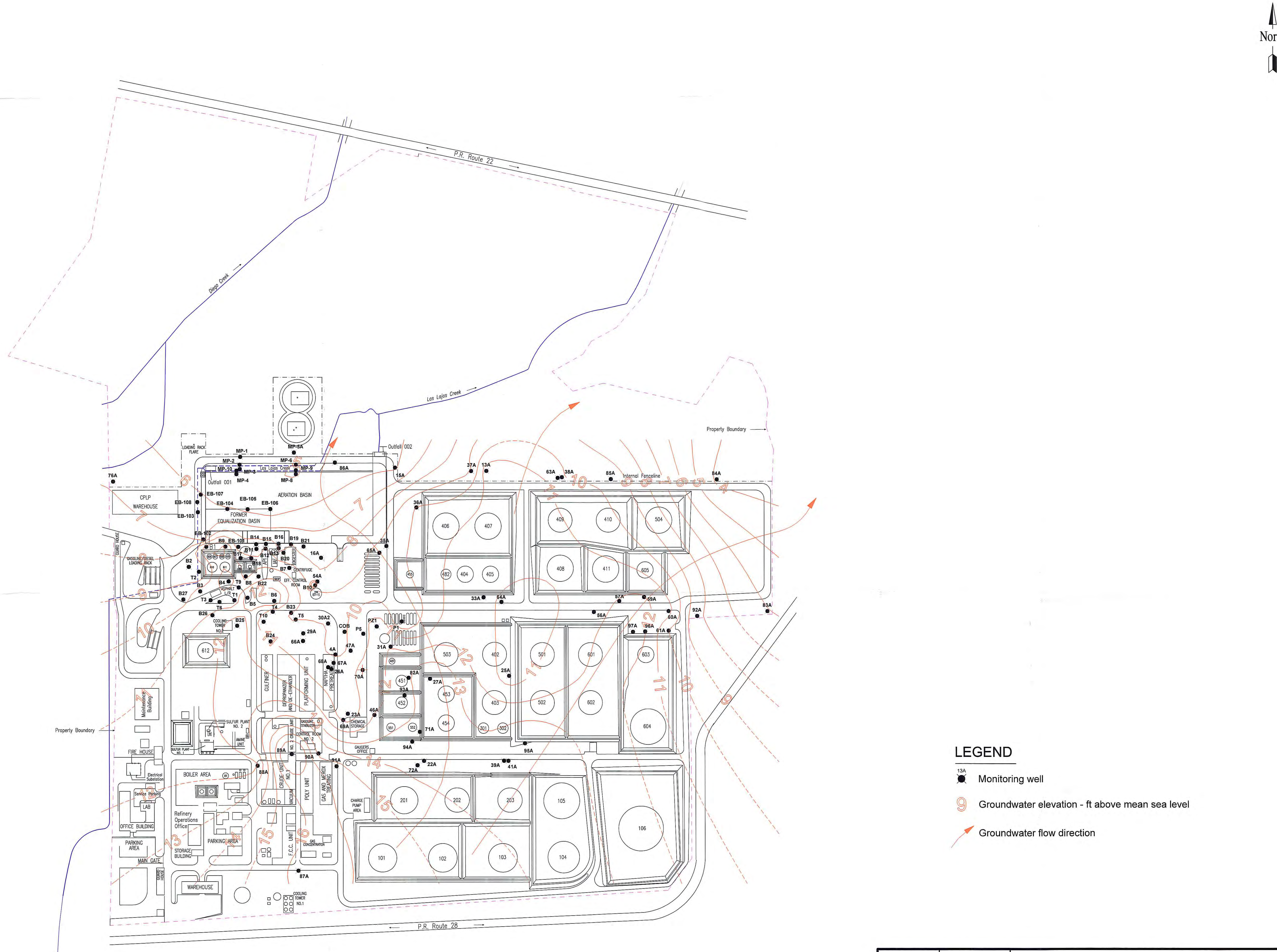


Figure 4-2E
Tidal Study Results, Well MW-20B
Sitewide Groundwater Monitoring Program
Caribbean Petroleum Refining, LP





LEGEND

13A Monitoring well

9 Groundwater elevation - ft above mean sea level

Groundwater flow direction

500 0 500 1000

Scale feet

Scale	Date
1/2400	Jan 2004

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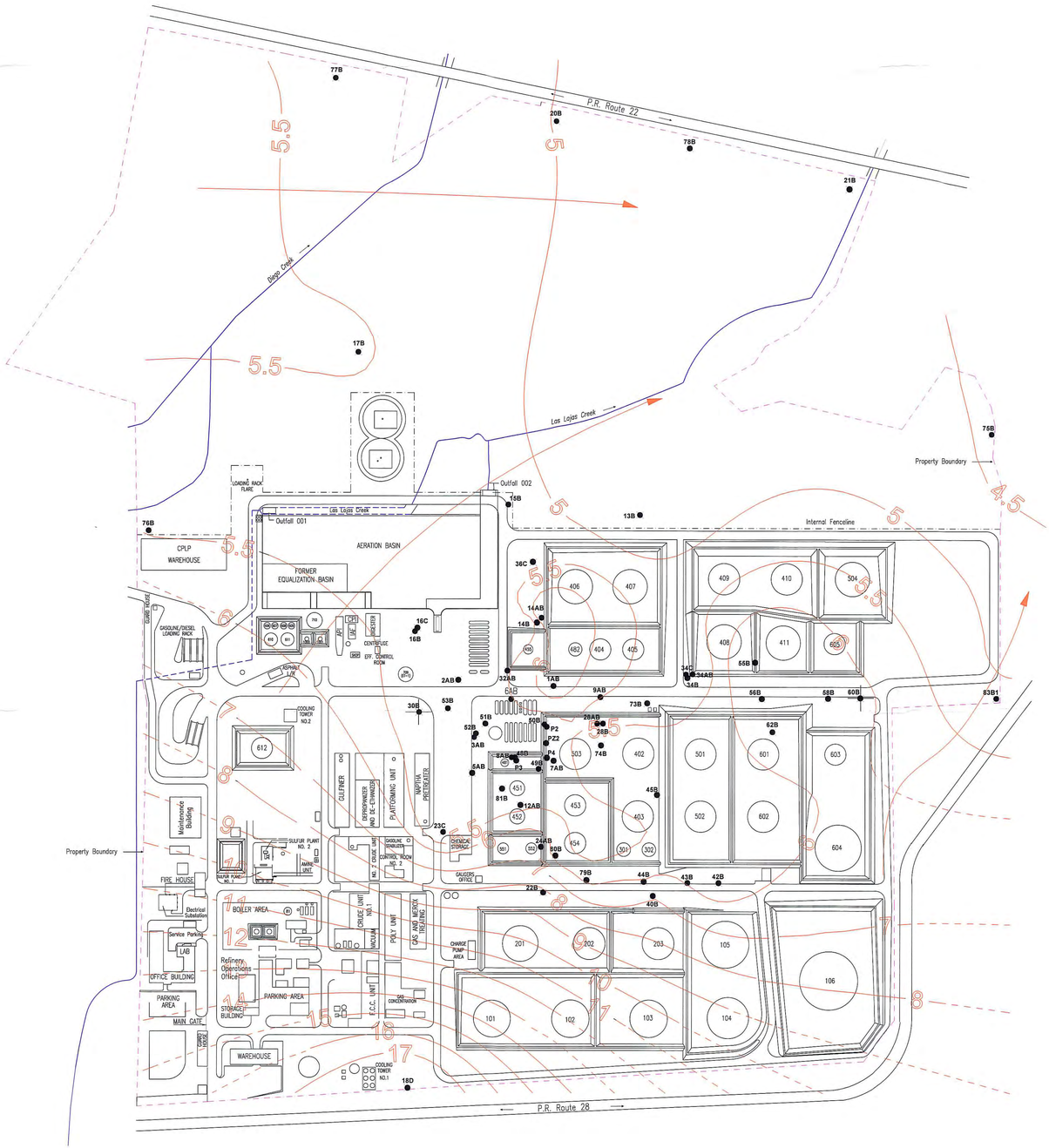
Figure 4-3

Groundwater Flow Direction
Upper Water Bearing Zone A

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North



LEGEND

- 13B — Monitoring well
- 9 — Groundwater elevation - ft above mean sea level
- Groundwater flow direction

500 0 500 1000
Scale feet

Scale	Date
1/2400	Jan 2004

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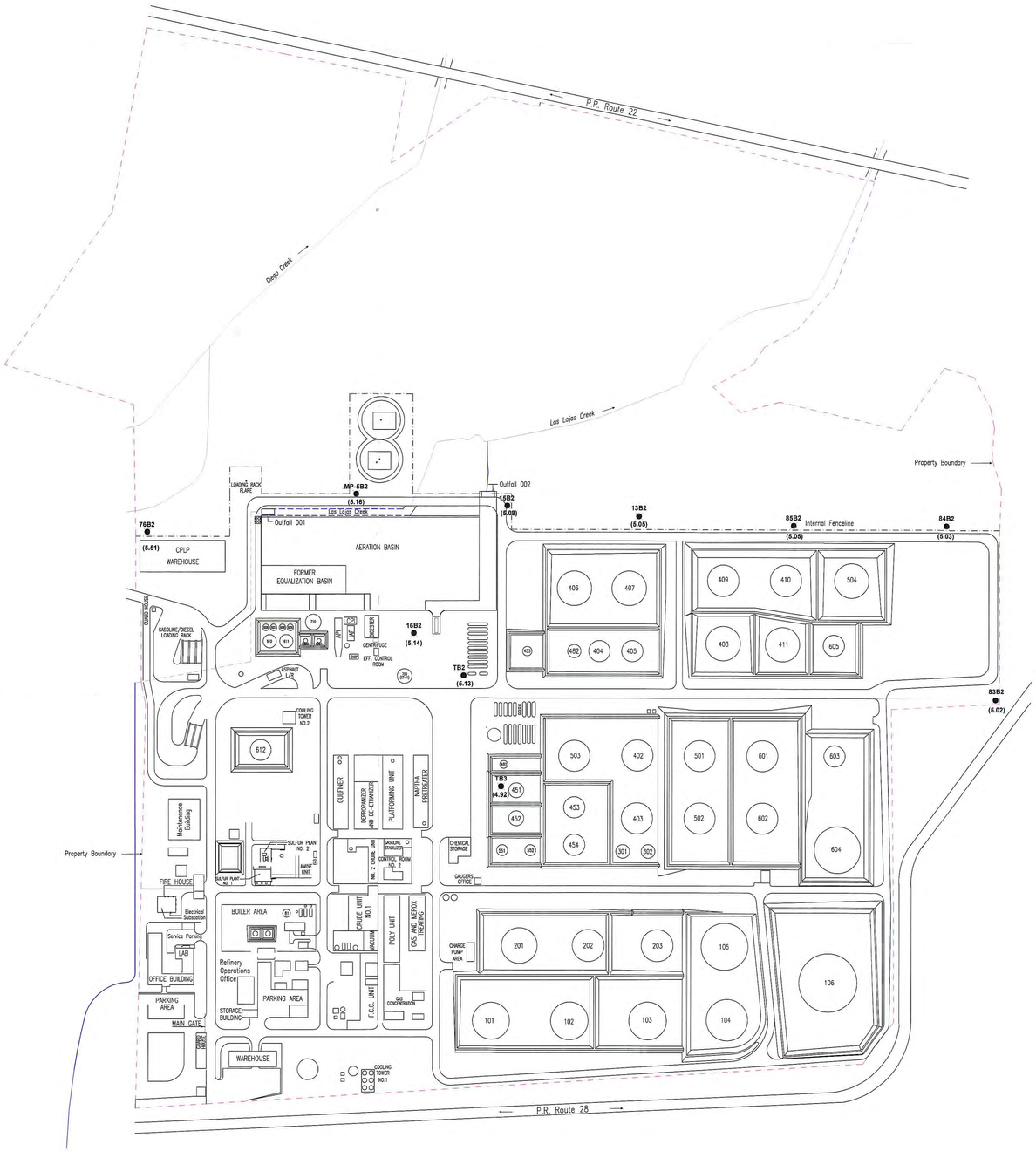
Figure 4-4

Groundwater Flow Direction
Lower Water Bearing Zone B/B1

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North



LEGEND

13B (4.11) Monitoring well (Water level shown in ft amsl in parentheses)

500 0 500 1000
Scale feet

Scale	Date
1/2400	Jan 2004

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Figure 4-5

Groundwater Elevation Map
Lower Water Bearing Zone B2

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North

ANALYTE	MP-5A		MP-5B2		MP-5B2	
ug/l	[15.5 - 18.5 ft bgl]		[50.3 - 60.3 ft bgl]		(duplicate)	
	Jul-03	Oct-03	Jul-03	Oct-03	Jul-03	Oct-03
Acetone	ND	ND	ND	4.3 J	ND	---
Chloroform	0.86 J	1.1	ND	ND	ND	---
cis-1,2-Dichloroethene	ND	ND	0.98 J	1.6	0.68 J	---
MTBE	ND	ND	11.4	5.7	6.6	---
Trichloroethene	ND	ND	3.7	1.3	2.8	---
1,2-Dichlorobenzene	ND	0.88 J	ND	ND	ND	---

ANALYTE	MW-86A	
ug/l	[11 - 21 ft bgl]	
	Jul-03	Oct-03
MTBE	3.5	ND
BNA	ND	ND

ANALYTE	MW-20B	
ug/l	[70.1 - 84.6 ft bgl]	
	May-03	Oct-03
VOC	ND	ND

ANALYTE	MW-78B	
ug/l	[82 - 92 ft bgl]	
	May-03	Oct-03
VOC	ND	ND

ANALYTE	MW-15A		MW-15-B2		MW-15-B2D	
ug/l	[9 - 19 ft bgl]		[37.8 - 47.8 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Carbon disulfide	1.8 J	1.7 J	ND	ND	1.1 J	---
MTBE	36.3	25.1	9.2	ND	9.2	---
BNA	ND	ND	ND	ND	ND	---

ANALYTE	MW-21B	
ug/l	[39.1 - 54.1 ft bgl]	
	May-03	Oct-03
Carbon disulfide	1.4 J	ND
MTBE	15.8	ND

ANALYTE	MW-13A		MW-13-B2		MW-13-B2	
ug/l	[5 - 15 ft bgl]		[40.7 - 50.7 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Benzene	**11.8**	0.34 J	ND	ND	---	ND
Ethylbenzene	62.1	2.4	0.9 J	ND	---	ND
MTBE	4.5	2.7	2.4	3.6	---	3.6
Xylene(total)	4.4	0.93 J	1.4	ND	---	ND
3&4-Methylphenol	3.3 J	ND	ND	ND	---	ND
2-Methylnaphthalene	14.6	ND	ND	ND	---	ND
Naphthalene	**37.6**	5.4	ND	ND	---	ND

ANALYTE	MW-16A		MW-16-B2		MW-16-B2D	
ug/l	[10 - 25 ft bgl]		[40 - 50 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Carbon disulfide	ND	ND	3.9 J	ND	---	ND
Chloroform	ND	ND	2	ND	---	ND
1,2-Dichloropropane	ND	ND	1.7	ND	---	ND
MTBE	3.5	3.1	6.5	6.5	---	6.6
BNA	ND	ND	ND	ND	---	ND

ANALYTE	MW-9		MW-9D	
ug/l	[2 - 12 ft bgl]		(duplicate)	
	Jul-03	Oct-03	Jul-03	Oct-03
Chlorobenzene	0.24 J	ND	---	ND
MTBE	1.0	0.96 J	---	0.91 J
BNA	ND	ND	---	ND

ANALYTE	B-16	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
MTBE	3.3	4.0
BNA	ND	ND

ANALYTE	B-15	
ug/l	[0.9 - 10.9 ft bgl]	
	Jul-03	Oct-03
Acetone	ND	12.6
MTBE	4.5	2.6
Di-n-butyl phthalate	ND	1.1 J

ANALYTE	MP-1	
ug/l	[18.8 - 21.8 ft bgl]	
	Jul-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	MP-10	
ug/l	[1.4 - 11.4 ft bgl]	
	Jul-03	Oct-03
Acetone	6.6 J	32.6
2-Butanone (MEK)	4.6 J	ND R
Carbon disulfide	0.49 J	ND
MTBE	0.56 J	ND
BNA	ND	ND

ANALYTE	EB-101	
ug/l	[12 - 22 ft bgl]	
	Jul-03	Oct-03
Acetone	7.6 J	ND R
MTBE	3.0	2.8
Acenaphthene	0.65 J	ND

ANALYTE	MW-76A		MW-76B2	
ug/l	[4 - 14 ft bgl]		[45 - 55 ft bgl]	
	Jul-03	Oct-03	Jul-03	Oct-03
MTBE	ND	ND	0.77 J	0.78 J
BNA	ND	ND	ND	ND

ANALYTE	B-9	
ug/l	[2.7 - 12.7 ft bgl]	
	Jul-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	B-1	
ug/l	[2 - 12 ft bgl]	
	Jul-03	Oct-03
Carbon disulfide	ND	3.7
MTBE	0.32 J	ND
BNA	ND	ND

ANALYTE	B-2	
ug/l	[3.2 - 13.2 ft bgl]	
	Jul-03	Oct-03
Acetone	16.5	ND
Benzene	**31.2**	**71.2**
Ethylbenzene	10.5	35.1
MTBE	517 J	652
Toluene	3.0	6.6
Xylene (total)	3.4	8.4
Fluorene	ND	0.84 J
2-Methylnaphthalene	7.6	36.9
Naphthalene	**52.7**	**174**

ANALYTE	B-11	
ug/l	[0.7 - 10.7 ft bgl]	
	Jul-03	Oct-03
Acetone	5.2 J	ND
Carbon disulfide	ND	2.1
Chlorobenzene	0.95 J	2.0
MTBE	0.53 J	ND
Acenaphthene	ND	3.4
Anthracene	ND	0.60 J
Di-n-butyl phthalate	ND	1.4 J
Fluorene	ND	4.5
2-Methylnaphthalene	ND	1.6 J
Phenanthrene	ND	1.2 J
Pyrene	ND	0.98 J

ANALYTE	PS-29G	
ug/l	[9 - 14 ft bgl]	
	Jul-03	
Acetone	22.0 J	
Benzene	1.3	
2-Butanone (MEK)	7.7 J	
Carbon disulfide	0.48 J	
Chlorobenzene	1.1	
MTBE	53.3	
Xylene (total)	0.39 J	
bis(2-Ethylhexyl)phthalate	**20.8**	
2-Methylnaphthalene	**122**	
Naphthalene	**81.7**	
Phenanthrene	4.9	

ANALYTE	PS-28G	PS-28GD
ug/l	[9 - 14 ft bgl]	(duplicate)
	Jul-03	Jul-03
Acetone	60.3 J	---
2-Butanone (MEK)	12.2 J	---
MTBE	5.4	---
Chrysene	**46.2 J**	5.5 J
Fluorene	**855 J**	105
2-Methylnaphthalene	**6100 J**	766 J
Phenanthrene	828 J	92.0 J
Pyrene	162 J	14.0 J

ANALYTE	PS-16G
ug/l	[15 - 20 ft bgl]
	Jul-03
Acetone	16.8 J
Ethylbenzene	80.7
Xylene (total)	19.7
Acenaphthene	11.4 J
Anthracene	1.4 J
Fluorene	14.0
2-Methylnaphthalene	**511 J**
Naphthalene	**358 J**
Phenanthrene	17.2

ANALYTE	PS-22G	PS-22GD
ug/l	[4 - 14 ft bgl]	(duplicate)
	Jul-03	Jul-03
Acetone	24.5 J	ND
Benzene	ND	0.36 J
Carbon disulfide	0.85 J	5.0 J
Ethylbenzene	ND	0.27 J
MTBE	1.7	2.6
Xylene (total)	0.27 J	0.76 J
BNA	ND	ND

ANALYTE	MW-88A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Benzene	4.7	**8.3**
Chloroform	3.5	ND
Ethylbenzene	3.7	6.8
MTBE	16.3	32.2
Methylene Chloride	0.43 J	ND
Toluene	0.29 J	ND
Xylene (total)	2.9	3.9
Acenaphthene	ND	1.9 J
Fluorene	ND	1.3 J
2-Methylnaphthalene	2.1	14.8
Naphthalene	ND	5.9
Phenanthrene	ND	0.97 J

ANALYTE	MW-89A	
ug/l	[5.3 - 15.3 ft bgl]	
	Jul-03	Oct-03
Acetone	33.8	ND R
Benzene	0.61 J	0.86 J
Carbon disulfide	0.68 J	ND
Chloroform	0.46 J	ND
MTBE	0.30 J	ND
Methylene Chloride	1.2 J	ND
3&4-Methylphenol	ND	1.8 J
Acenaphthene	0.84 J	0.94 J
Carbazole	ND	0.80 J
Dibenzofuran	ND	0.81 J
Fluorene	2.3	2.2
2-Methylnaphthalene	22.6	14.3
Naphthalene	**16.9**	**12.3**
Phenanthrene	0.61 J	0.82 J

ANALYTE	MW-87A	
ug/l	[9 - 19 ft bgl]	
	Jul-03	Oct-03
Acetone	5.6 J	ND
BNA	ND	ND

ANALYTE	MW-90A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Carbon disulfide	ND	6.3
Chloroform	13.6	ND
BNA	ND	ND

ANALYTE	MW-91A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Acetone	258	ND R
Benzene	**2910**	**1830**
Ethylbenzene	195	390
MIBK	83.6	ND
Toluene	397	57.4
Xylene (total)	2220	922
2,4-Dimethylphenol	113	84.0
2-Methylphenol	225	13.0
3&4-Methylphenol	ND	55.4
Phenol	ND	16.1
Acenaphthene	ND	0.74 J
Fluorene	1.2 J	0.75 J
2-Methylnaphthalene	68.3	47.3
Naphthalene	**168**	**166**
Phenanthrene	0.85 J	ND

ANALYTE	PS-15G
ug/l	[9 - 14 ft bgl]
	Jul-03
Acetone	75.0 J
Benzene	**309**
2-Butanone (MEK)	32.3
Carbon disulfide	2.6 J
Chloroform	1.4
Chloromethane	1.0
1,2-Dichloroethane	**6.9 J**
Ethylbenzene	143
MIBK	12.1
Toluene	53.1
Xylene (total)	633
2-Methylnaphthalene	13.5 J
Naphthalene	**18.1 J**

ANALYTE	34-6G
ug/l	[9.5 - 19.5 ft bgl]
	Jul-03
Acetone	7.5 J
bis(2-Ethylhexyl)phthalate	2.9 J

ANALYTE	34-7G
ug/l	[10 - 20 ft bgl]
	Jul-03
Acetone	15.0 J
Chloromethane	0.56 J
Toluene	0.33 J
BNA	ND

ANALYTE	34-8G
ug/l	[12 - 16 ft bgl]
	Jul-03
Acetone	19.8 J
Carbon disulfide	2.0
Chrysene	0.82 J
Diethyl phthalate	1.4 J
Pyrene	1.3 J

ANALYTE	MW- 85A		MW- 85-B2	
ug/l	[3.8 - 13.8 ft bgl]		[45 - 55 ft bgl]	
	May-03	Oct-03	May-03	Oct-03
Acetone	ND	ND	18.9	ND
Chloroform	0.8 J	ND	ND	ND
MTBE	ND	ND	ND	6.0
BNA	ND	ND	ND	ND

ANALYTE	MW-75B	
ug/l	[45 - 55 ft bgl]	
	May-03	Oct-03
1,2-Dichloroethane	0.8 J	ND
cis-1,2-Dichloroethene	45.3	**71.7**
trans-1,2-Dichloroethene	6.7	10.4
MTBE	7.6	6.0
Tetrachloroethene	0.8 J	1.5
Trichloroethene	**83.8**	**106**
Vinyl Chloride	**3.1**	**5.8**

ANALYTE	MW-84A		MW-84-B2	
ug/l	[5 - 15 ft bgl]		[41.9 - 51.9 ft bgl]	
	May-03	Oct-03	May-03	Oct-03
Acetone	21.4	ND	ND	ND
Benzene	0.40 J	0.41 J	ND	ND
Carbon disulfide	ND	1.7 J	ND	ND
cis-1,2-Dichloroethene	ND	ND	2.9	18.4
trans-1,2-Dichloroethene	ND	ND	0.8 J	5.9
MTBE	ND	ND	9.9	8.9
Tetrachloroethene	ND	ND	ND	1.2
Trichloroethene	ND	ND	**12.9 J**	**68.7**
Vinyl Chloride	ND	ND	ND	1.3
3&4-Methylphenol	1.9 J	ND	ND	ND
Acenapthene	0.7 J	ND	ND	ND
Dibenzofuran	1.5 J	ND	ND	ND
Fiourene	2.1 J	1.2 J	ND	ND
2-Methylnaphthalene	5.7	ND	ND	ND
Naphthalene	**11.1**	ND	ND	ND
Phenanthrene	3.0	ND	ND	ND

ANALYTE	11-11G
ug/l	[12 - 17 ft bgl]
	Jul-03
VOC	ND
Butyl benzyl phthalate	1.0 J

ANALYTE	11-13G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	7.8 J
Chlorobenzene	0.26 J
Methylene Chloride	**6.0**
Toluene	0.42 J
Dibenzofuran	0.80 J
Fluorene	0.57 J

ANALYTE	11-2G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	6.0 J
Benzene	**6.6**
Carbon disulfide	2.6 J
Chloromethane	0.45 J
Ethylbenzene	0.28 J
Xylene (total)	1.7
Acenaphthene	2.3 J
Benzo(a)pyrene	**0.61 J**
Carbazole	3.1 J
Chrysene	2.9 J
Fluorene	5.4 J
2-Methylnaphthalene	7.6 J
Naphthalene	5.7 J
Phenanthrene	26.4 J
Pyrene	4.9 J

ANALYTE	MW-TB-2	
ug/l	[40.5 - 50.5 ft bgl]	
	May-03	Oct-03
MTBE	3.5	2.9
BNA	ND	ND

ANALYTE	MW-TB-3	MW-TB-3D	
ug/l	[39 - 49 ft bgl]	(duplicate)	
	May-03	Oct-03	May-03	Oct-03
1,2-Dichloroethane	0.7 J	ND	---	ND
MTBE	7.9	5.3	---	5.2
BNA	ND	ND	---	ND

ANALYTE	MW-83A		MW-83-B1		MW-83-B2		MW-83-B2D	
ug/l	[1.2 - 11.2 ft bgl]		[27-37 ft bgl]		[50.9-60.9 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Acetone	16.7	ND	ND	ND	ND	ND	ND	---
Chloroform	ND	ND	0.6 J	1.3	0.4 J	18.1	ND	---
cis-1,2-Dichloroethene	ND	ND	20	15.6	15.1	2.2	15.2	---
trans-1,2-Dichloroethene	ND	ND	4.3	2.2	2.5	ND	2.4	---
MTBE	ND	ND	2.8	2.2	4.4	5.5	4.3	---
Tetrachloroethene	ND	ND	3.6	3.4	2.5	2.1	2.3	---
Trichloroethene	ND	ND	**154 J**	**138**	**127 J**	**122**	**126 J**	---
Vinyl Chloride	ND	ND	**2.6**	ND	1.2	ND	1.1	---
Phenol	1.4 J	ND	ND	ND	ND	ND	ND	---
Acenaphthene	2.9	1.2 J	ND	ND	ND	ND	ND	---
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	1.2 J	ND	ND	---
Fluorene	1.3 J	0.56 J	ND	ND	ND	ND	ND	---
2-Methylnaphthalene	ND	0.60 J	0.61 J	ND	ND	ND	ND	---

ANALYTE	MW-60B	MW-60BD
ug/l	[22.5 - 27.5 ft bgl]	(duplicate)
	Dec-03	Dec-03
Benzene	0.67 J	0.64 J
MTBE	12	13.4
Vinyl Chloride	**2.1**	**2.3**

ANALYTE	MW-61A	
ug/l	[2 - 17 ft bgl]	
	May-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	MW-30A(2)	
ug/l	[3 - 13 ft bgl]	
	May-03	Oct-03
Acetone	54.3	ND
Benzene	**113**	**114**
2-Butanone	30.3	ND
Ethylbenzene	81.8	110
MIBK	12.9	ND
Toluene	16.1	10.2
Xylene(total)	125	202
Fluorene	ND	0.65 J
2-Methylnaphthalene	11.9	36.4
Naphthalene	**82.4**	**122**

ANALYTE	MW-72A	
ug/l	[2 - 17 ft bgl]	
	May-03	Oct-03
VOC	ND	ND
BNA	ND	ND

NOTES

1. Detections above groundwater screening levels are highlighted and bolded.
2. ND - not detected
3. J - estimated value
4. --- not analyzed
5. R - rejected
6. Depth of screened interval provided for each well.
7. Groundwater screening levels are presented below. MCLs in bold. Other screening levels in italics. NA - not available.

ANALYTE	MCL or RBSL
VOCs (ug/l)	
Acetone	*610*
Benzene	**5**
2-Butanone (MEK)	*1,900*
Carbon disulfide	*1,000*
Chlorobenzene	**100**
Chloroform	**80**
Chloromethane	*2.1*
cis-1,2-Dichloroethene	**70**
trans-1,2-Dichloroethene	**100**
1,2-Dichloroethane	**5**
Ethylbenzene	**700**
Methyl Tert Butyl Ether (MTBE)	NA
4-Methyl-2-Pentanone (MIBK)	*140*
Methylene Chloride	**5**
Tetrachloroethene	**5**
Toluene	**1,000**
Trichloroethene	**5**
Vinyl chloride	**2**
Xylene (total)	**10,000**
BNAs (ug/l)	
2,4-Dimethylphenol	*730*
2-Methylphenol	*1,800*
3&4-Methylphenol	*180*
Phenol	*11,000*
Acenaphthene	*370*
Anthracene	*1,800*
Acenaphthylene	NA
Benzo(a)pyrene	**0.2**
Carbazole	*3.3*
Chrysene	*9.2*
Dibenzofuran	*24*
Di-n-butyl phthalate	*3,700*
Diethyl phthalate	*29,000*
bis(2-Ethylhexyl)phthalate	**6.0**
Fluorene	*240*
2-Methylnaphthalene	*120*
Naphthalene	*6.5*
Phenanthrene	NA
Pyrene	*180*

LEGEND

- Groundwater Monitoring Location
- Direct-push Groundwater Sampling Location
- Free Phase Hydrocarbon Plume-Upper Zone, Sep 2003
- Free Phase Hydrocarbon Plume-Lower Zone, Sep 2003

500 0 500
Scale feet

Scale	Date
1/2400	Jan 2004

ANDERSON - MULHOLLAND & ASSOCIATES, INC.
WHITE PLAINS, NEW YORK
SAN JUAN, PUERTO RICO

Figure 5-1

VOC and BNA Concentrations in Groundwater

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North

ANALYTE	MP-5A			MP-5B2			MP-5B2D	
ug/l	[15.5 - 18.5 ft bgl]			[50.3 - 60.3 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03
Antimony	2.6 B	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	9.6 B	**10.7**	**20.2 J**	**10.6**	**11.9**
Barium	98.0 B	94.1 B	70.2 B	245	247	231	246	236
Beryllium	0.1 B	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	2.3 B	ND	ND
Chromium	2.3 B	ND	3.1 B	ND	ND	38.5	0.8 B	ND
Cobalt	14.3 B	13.9 B	10.7 B	3.9 B	3.4 B	11.6 B	3.6 B	3.2 B
Lead	2.2 B	ND	4.2 J	ND	ND	3.7 J	ND	ND
Mercury	0.1 BJ	ND	ND	0.2 BJ	0.1 BJ	ND	ND	0.1 BJ
Nickel	4.6 B	4.8 B	9.0 B	3.3 B	ND	18.3 B	ND	ND
Selenium	ND	ND	ND	2.8 B	2.2 B	ND	ND	ND
Vanadium	5.3 B	ND	0.63 B	1.2 B	ND	68.7	1.2 B	ND

ANALYTE	MP-9			MP-9D
ug/l	[2 - 12 ft bgl]			(duplicate)
	total	dissolved	total	total
	Jul-03	Jul-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND
Barium	247	249	274	283
Beryllium	ND	ND	ND	ND
Cadmium	ND	ND	ND	0.65 BJ
Chromium	ND	ND	ND	ND
Cobalt	18.6	19.5	20.2 BJ	20.4 BJ
Lead	ND	ND	ND	ND
Mercury	ND	ND	ND	ND
Nickel	5.2 B	4.4 B	5.7 BJ	5.5 BJ
Selenium	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND

ANALYTE	MW-86A		
ug/l	[11 - 21 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	1050	1120	1180
Beryllium	ND	ND	ND
Cadmium	0.7 B	0.6 B	6.8 J
Chromium	3.5 B	ND	ND
Cobalt	180	189	223
Lead	ND	ND	3.4 J
Mercury	ND	ND	ND
Nickel	53.2	54.3	63.3 J
Selenium	ND	ND	ND
Vanadium	5.5 B	ND	2.8 B

ANALYTE	MW-78B		
ug/l	[82 - 92 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	---	ND	---
Arsenic	---	ND	---
Barium	---	39.5 B	---
Beryllium	---	ND	---
Cadmium	---	ND	---
Chromium	---	4.6 BJ	---
Cobalt	---	ND	---
Lead	---	ND	ND
Mercury	1.4	ND	**2.3**
Nickel	---	2.0 B	---
Selenium	---	ND	---
Vanadium	---	ND	---

ANALYTE	MW-21B		
ug/l	[39.1 - 54.1 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	ND	ND	---
Barium	71.8 B	73.0 B	---
Beryllium	ND	ND	---
Cadmium	ND	ND	---
Chromium	11.8 R	28.9 R	---
Cobalt	ND	1.10 B	---
Lead	ND	ND	ND
Mercury	ND	**2.2**	**3.4**
Nickel	3.6 B	3.4 B	---
Selenium	ND	ND	---
Vanadium	ND	6.1 B	---

ANALYTE	MW-15A			MW-15B2			MW-15B2D	
ug/l	[9 - 19 ft bgl]			[9 - 19 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03
Antimony	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3.6 B	ND	ND	**17**	**16.8**	**15.2 J**	**18.1**	**18.7**
Barium	67.4 B	58.5 B	59.6 B	736	706	640	762	739
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	4.4 B	ND	ND	0.93 B	ND	2.6 BJ	0.89 B	ND
Cobalt	73.3	70.8	83.7	1.2 B	0.7 B	1.5 B	1.0 B	0.9 B
Lead	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	12.6 B	12.1 B	10.8 BJ	5.2 B	5.0 B	9.4 BJ	4.9 B	4.3 B
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	7.2 B	ND	1.6 B	ND	ND	0.74 B	ND	ND

ANALYTE	MP-1		
ug/l	[18.8 - 21.8 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	4.6 BJ
Barium	317	312	343
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	63.4	63.2	71.3
Lead	ND	ND	3.0 BJ
Mercury	ND	ND	ND
Nickel	8.8 B	7.7 B	9.5 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	0.95 B

ANALYTE	B-16		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	105 B	94.3 B	136 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	1.6 B	ND	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	5.8 B	4.5 B	3.1 BJ
Selenium	ND	ND	ND
Vanadium	7.9 B	2.4 B	ND

ANALYTE	MW-13A			MW-13B2			MW-13B2D
ug/l	[15 - 15 ft bgl]			[15 - 15 ft bgl]			(duplicate)
	total	dissolved	total	total	dissolved	total	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	4.8 B	7.9 B	**10.7 J**	**26.4**	**24.7**	**26.7 J**	**26.2 J**
Barium	482	483	336	589	591	504	498
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.81 B	ND	ND	ND	ND
Chromium	ND	ND	ND	2.0 B	ND	8.4 B	ND
Cobalt	9.6 B	10.7 B	10.7 B	1.0 B	ND	0.88 B	0.80 B
Lead	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Nickel	23.7 B	3.4 B	6.5 B	1.9 B	1.7 B	9.5 BJ	5.2 BJ
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	1.9 B	ND	0.80 B	ND

ANALYTE	B-11		
ug/l	[0.7 - 10.7 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	**36.9 J**
Barium	71.4 B	74.3 B	426
Beryllium	ND	ND	0.92 BJ
Cadmium	ND	ND	1.0 BJ
Chromium	3.2 B	ND	**139**
Cobalt	2.4 B	1.7 B	86.2 J
Lead	ND	ND	**67.8 J**
Mercury	ND	ND	0.82 B
Nickel	4.9 B	2.2 B	90.7 J
Selenium	3.2 B	ND	7.2
Vanadium	6.7 B	ND	**492**

ANALYTE	MP-10		
ug/l	[1.4 - 11.4 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	4.4 B	4.8 B	ND
Barium	332	109 B	121 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	3.8 B	ND	ND
Cobalt	80.2	106	32.4 BJ
Lead	11.2	ND	3.0 BJ
Mercury	ND	ND	ND
Nickel	40.8	47.5	18.4 BJ
Selenium	ND	ND	ND
Vanadium	6.6 B	ND	3.4 B

ANALYTE	B-15		
ug/l	[0.9 - 10.9 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	7.2 B	4.8 BJ
Barium	69.7 B	62.6 B	69.4 B
Beryllium	ND	0.3 B	ND
Cadmium	ND	ND	ND
Chromium	0.6 B	1.2 B	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	5.9 B	6.8 B	4.7 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	1.0 B

ANALYTE	MW-20B		
ug/l	[70.1 - 84.6 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	2.80 B	ND	---
Barium	88.10B	82.2 B	---
Beryllium	ND	ND	---
Cadmium	0.37 B	ND	---
Chromium	7.70 BJ	ND	---
Cobalt	4.50 B	ND	---
Lead	ND	ND	ND
Mercury	ND	ND	0.04 B
Nickel	5.80 B	4.20 B	---
Selenium	ND	ND	---
Vanadium	10.20 B	ND	---

ANALYTE	34-7G	
ug/l	[10 - 20 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	8.9 B	6.0 B
Barium	534	678
Beryllium	ND	ND
Cadmium	0.73 B	0.57 B
Chromium	7.7 B	ND
Cobalt	4.3 B	1.8 B
Lead	ND	ND
Mercury	0.13 BJ	ND
Nickel	4.6 B	ND
Selenium	ND	ND
Vanadium	18.0 B	ND

ANALYTE	34-6G	
ug/l	[9.5 - 19.5 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**10.1**	3.8 B
Barium	1100	847
Beryllium	0.35 B	ND
Cadmium	3.0 B	1.2 B
Chromium	55.5	ND
Cobalt	31.2 B	63.2
Lead	13.0	ND
Mercury	0.43 J	ND
Nickel	23.0 B	11.8 B
Selenium	ND	ND
Vanadium	181	8.8 B

ANALYTE	MW-85A			MW-85B2		
ug/l	[3.8 - 13.8 ft bgl]			[45 - 55 ft bgl]		
	total	dissolved	total	total	dissolved	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	**69.2**	**64.7**	**53.0 J**
Barium	229	254	168 B	719	696	580
Beryllium	0.24 B	ND	ND	0.15 B	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	2.5 B	ND	1.0 B
Cobalt	1.1 B	0.62 B	1.7 B	3.5 B	2.0 B	1.1 B
Lead	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	4.0 B	3.8 B	3.9 B	5.5 B	2.5 B	3.3 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	ND	1.1 B	ND	2.4 B	ND	1.1 B

ANALYTE	34-8G	
ug/l	[12 - 16 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**21.7 J**	4.2 BJ
Barium	329	174 B
Beryllium	ND	ND
Cadmium	0.56 B	ND
Chromium	**104**	ND
Cobalt	29.3 B	9.3 B
Lead	11.6 J	ND
Mercury	ND	ND
Nickel	85.4 J	28.2 BJ
Selenium	ND	ND
Vanadium	**671**	16.2 B

ANALYTE	MW-76A			MW-76B2		
ug/l	[4 - 14 ft bgl]			[45 - 55 ft bgl]		
	total	dissolved	total	total	dissolved	total
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	4.8 BJ	4.5 B	4.5 B	ND
Barium	91.5 B	93.6 B	79.7 B	424	445	463
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.5 B	ND	ND	ND	ND	0.56 B
Chromium	3.0 B	ND	2.8 B	4.2 B	ND	1.2 B
Cobalt	22.2 B	23.1 B	23.0 B	5.4 B	4.5 B	5.7 B
Lead	ND	ND	2.8 BJ	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	16.3 B	17.1 B	17.9 B	28.0 B	20.6 B	25.2 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	6.6 B	ND	3.7 B	9.6 B	1.0 B	4.6 B

ANALYTE	MW-75B		
ug/l	[45 - 55 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	2.8 B	ND	---
Barium	54.1 B	48.2 B	---
Beryllium	ND	ND	---
Cadmium	ND	ND	---
Chromium	5.9 B	ND	---
Cobalt	2.3 B	1.0 B	---
Lead	ND	ND	ND
Mercury	0.15 B	ND	ND
Nickel	3.8 B	2.0 B	---
Selenium	ND	ND	---
Vanadium	11.0 B	ND	---

ANALYTE	11-13G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**37.0**	**13.2**
Barium	619	557
Beryllium	1.1 B	ND
Cadmium	2.2 B	3.4 B
Chromium	58.9	6.6 B
Cobalt	85.4	94.0
Lead	4.4	ND
Mercury	0.16 BJ	ND
Nickel	71.3	58.5
Selenium	ND	ND
Vanadium	85.4	4.8 B

ANALYTE	B-9		
ug/l	[2.7 - 12.7 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	3.7 B	ND
Barium	57.5 B	46.1 B	163 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	1.0 B	ND	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.4 B	4.0 B	ND
Selenium	ND	ND	ND
Vanadium	2.4 B	4.0 B	5.5 B

ANALYTE	B-1		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	285	302	449
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	2.1 B	ND	ND
Cobalt	0.9 B	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.7 B	3.8 B	ND
Selenium	ND	ND	ND
Vanadium	5.3 B	ND	ND

ANALYTE	11-11G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**45.1**	ND
Barium	198 B	233
Beryllium	0.67 B	ND
Cadmium	0.94 B	0.9 B
Chromium	67.8	ND
Cobalt	75.6	119
Lead	ND	ND
Mercury	0.38 J	ND
Nickel	84.8	87.6
Selenium	ND	ND
Vanadium	119	ND

ANALYTE	11-2G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**29.3**	ND
Barium	202	113 B
Beryllium	ND	ND
Cadmium	ND	ND
Chromium	73.0	ND
Cobalt	35.2 B	37.6 B
Lead	6.6	ND
Mercury	ND	0.1 BJ
Nickel	19.1 B	10.4 B
Selenium	ND	ND
Vanadium	89.2	ND

ANALYTE	MW-84A			MW-84B2		
ug/l	[5 - 15 ft bgl]			[41.9 - 51.9 ft bgl]		
	total	dissolved	total	total	dissolved	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03
Antimony	6.1 B	5.4 B	ND	ND	ND	ND
Arsenic	ND	ND	8.7 BJ	3.8 B	3.2 B	ND
Barium	966	895	900	207	208	194 B
Beryllium	ND	ND	ND	0.20 B	0.16 B	ND
Cadmium	ND	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	1.6 B	ND	ND
Cobalt	41.2 B	35.8 B	53.6	2.0 B	1.1 B	1.4 B
Lead	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	7.7 B	4.7 B	17.5 B	4.3 B	2.8 B	3.2 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	2.3 B	ND	ND

ANALYTE	B-2		
ug/l	[3.2 - 13.2 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	7.6 BJ
Barium	357	347	724
Beryllium	ND	ND	ND
Cadmium	ND	ND	2.6 BJ
Chromium	2.5 B	ND	1.9 BJ
Cobalt	ND	1.8 B	ND
Lead	2.7 B	ND	6.3 J
Mercury	ND	ND	ND
Nickel	6.5 B	3.9 B	ND
Selenium	3.5 B	ND	ND
Vanadium	1.0 B	ND	1.8 B

ANALYTE	EB-101		
ug/l	[12 - 22 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	147 B	153 B	184 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	1.4 B	1.8 B	1.4 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.9 B	3.4 B	2.9 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-92A		
ug/l	[1 - 11 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	8.2 B	3.6 B	5.7 BJ
Chromium	ND	ND	---

ANALYTE	MW-83A			MW-83B1			MW-83B2			MW-83B2D	
ug/l	[1.2 - 11.2 ft bgl]			[27 - 37 ft bgl]			[50.9 - 60.9 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved	total	total	dissolved
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	5.0 BJ	ND	3.0 B	ND	ND	ND	ND	ND	ND
Barium	27.9 B	28.4 B	27.6 B	142 B	139 B	67.2 B	116 B	101 B	161 B	127 B	99.8 B
Beryllium	0.10 B	0.14 B	ND	ND	ND	ND	0.17	0.12 B	ND	0.16 B	0.10 B
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	4.8 B	ND	12.9	0.41 B	ND	ND	2.8 B	0.81 B	6.7 B	3.2 B	ND
Cobalt	ND	ND	ND	1.8 B	1.8 B	1.1 B	2.2 B	1.3 B	2.8 B	2.2 B	1.4 B
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	2.5 B	ND	8.2 B	2.4 B	2.6 B	ND	2.7 B	2.6 B	6.6 B	4.9 B	4.0 B
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	1.8 B	2.5 B	5.6 B	ND	ND	1.9 B	2.0 B	ND	7.1 B	3.2 B	ND

ANALYTE	MW-59A		
ug/l	[1 - 11 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	5.9 BJ
Chromium	ND	ND	ND

ANALYTE	PS-29G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	ND	ND
Barium	314	287
Beryllium	ND	ND
Cadmium	ND	ND
Chromium	4.9 B	1.3 B
Cobalt	2.3 B	1.2 B
Lead	2.6 BJ	ND
Mercury	ND	ND
Nickel	5.2 BJ	3.5 BJ
Selenium	ND	ND
Vanadium	10.6 B	ND

ANALYTE	PS-28G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**55.4**	ND
Barium	**3590**	622
Beryllium	**10.4**	ND
Cadmium	ND	ND
Chromium	**1130**	ND
Cobalt	160	1.6 B
Lead	**170**	ND
Mercury	ND	0.12 BJ
Nickel	297 J	3.6 BJ
Selenium	29.4 J	ND
Vanadium	**2850**	ND

ANALYTE	PS-16G	
ug/l	[15 - 20 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**30.0**	ND
Barium	489	1.5 B
Beryllium	0.79 B	ND
Cadmium	1.7 B	ND
Chromium	37.2	ND
Cobalt	7.4 B	ND
Lead	2.7 BJ	ND
Mercury	0.12 BJ	ND
Nickel	30.8 B	ND
Selenium	ND	ND
Vanadium	79.0	ND

ANALYTE	MW-96A		
ug/l	[0.5 - 8 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	9.3 B	ND	ND
Chromium	7.8 B	ND	---

ANALYTE	MW-61A		
ug/l	[2 -17 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	2.7 B	ND	6.6 BJ
Barium	134 B	132 B	132 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.4 BJ
Chromium	ND	ND	ND
Cobalt	0.62 B	0.62 B	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	ND	ND	5.1 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-16A			MW-16B2			MW-16B2D
ug/l	[10 - 25 ft bgl]			[4 - 14 ft bgl]			(duplicate)
	total	dissolved	total	total	dissolved	total	total
	May-03	May-03	Oct-03	Jul-03	Jul-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	**31.8**	**30.8**	**22.4 J**	**17.9 J**
Barium	122 B	119 B	111 B	654	654	612	602
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.46 B	0.41 B	2.6 BJ	ND	ND	ND	ND
Chromium	ND	ND	ND	ND	ND	1.8 BJ	ND
Cobalt	7.7 B	6.0 B	7.5 B	ND	ND	2.8 B	1.3 B
Lead	ND	ND	ND	ND	ND	ND	ND
Mercury	0.09 R	0.09 R	ND	ND	ND	ND	ND
Nickel	3.9 B	2.4 B	3.7 BJ	6.3 B	6.7 B	13.1 BJ	10.7 BJ
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	3.2 B	0.89 B

ANALYTE	MW-97A		
ug/l	[5 - 15 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	ND	0.70 B	---

ANALYTE	PS-22G		PS-22GD	
ug/l	[4 - 14 ft bgl]		(duplicate)	
	total	dissolved	total	dissolved
	Jul-03	Jul-03	Jul-03	Jul-03
Antimony	ND	ND	ND	ND
Arsenic	3.6 BJ	8.2 BJ	ND	ND
Barium	294 J	545 J	279	254
Beryllium	ND	0.97	ND	ND
Cadmium	ND	1.0 B	ND	ND
Chromium	21.6 J	90.2 J	ND	ND
Cobalt	35.8 B	72.9	23.5 BJ	32.0BJ
Lead	3.6 J	9.4 J	ND	ND
Mercury	ND	ND	ND	ND
Nickel	19.1 B	45.6	11.0 B	11.1 B
Selenium	ND	ND	ND	ND
Vanadium	50.4 J	198 J	ND	ND

ANALYTE	PS-15G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**14.4**	ND
Barium	690	312
Beryllium	1.1 B	ND
Cadmium	ND	ND
Chromium	51.8	ND
Cobalt	43.8 B	18.1 BJ
Lead	**17.0**	ND
Mercury	ND	ND
Nickel	35.0 B	11.4 B
Selenium	3.4 BJ	ND
Vanadium	117	ND

ANALYTE	MW-82A			MW-82AD	
ug/l	[16 - 26 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03
Arsenic	7.0 B	5.7 B	6.2 BJ	7.0 B	ND
Chromium	ND	ND	ND	1.6 B	ND

ANALYTE	MW-30-A(2)		
ug/l	[3 - 13 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	3.9 B	ND
Arsenic	**16.5**	**16.7**	**33.5 J**
Barium	377	390	600
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.3 BJ
Chromium	ND	ND	0.85 BJ
Cobalt	1.2 B	1.7 B	1.5 B
Lead	5.9	4.4	2.8 B
Mercury	ND	ND	ND
Nickel	ND	ND	5.6 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-TB2		
ug/l	[40.5 - 50.5 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	**36.6**	**33.4**	**31.7**
Barium	704	728	731
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	1.5 B	0.87 B	0.89 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	13.2 B	10.7 B	17.0 B
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-41A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	**53.9**	8.9 B	6.1 BJ
Chromium	33.5	ND	ND

ANALYTE	MW-95A		
ug/l	[9 - 19 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	3.9 BJ	ND	ND
Chromium	6.8 BJ	ND	---

ANALYTE	MW-93A		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	1.0 BJ	ND	---

ANALYTE	MW-94A		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	4.7 BJ	5.0 BJ	ND
Chromium	12.5 J	ND	---

ANALYTE	MW-87A		
ug/l	[9 - 19 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	12.6	11.8	15.3 J
Selenium	ND	3.5 B	ND

ANALYTE	MW-TB3			MW-TB3D
ug/l	[39 - 49 ft bgl]			duplicate
	total	dissolved	total	total
	May-03	May-03	Oct-03	Oct-03
Antimony	ND	2.8 B	ND	ND
Arsenic	ND	ND	ND	ND
Barium	92.3 B	85.3 B	83.0 B	83.7 B
Beryllium	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND
Chromium	0.87 BJ	1.5 B	ND	ND
Cobalt	0.86 B	1.1 B	ND	ND
Lead	ND	ND	ND	ND
Mercury	0.18 B	ND	ND	ND
Nickel	5.8 B	8.6 B	6.8 BJ	7.1 BJ
Selenium	ND	ND	ND	ND
Vanadium	1.5 B	1.6 B	1.2 B	0.86 B

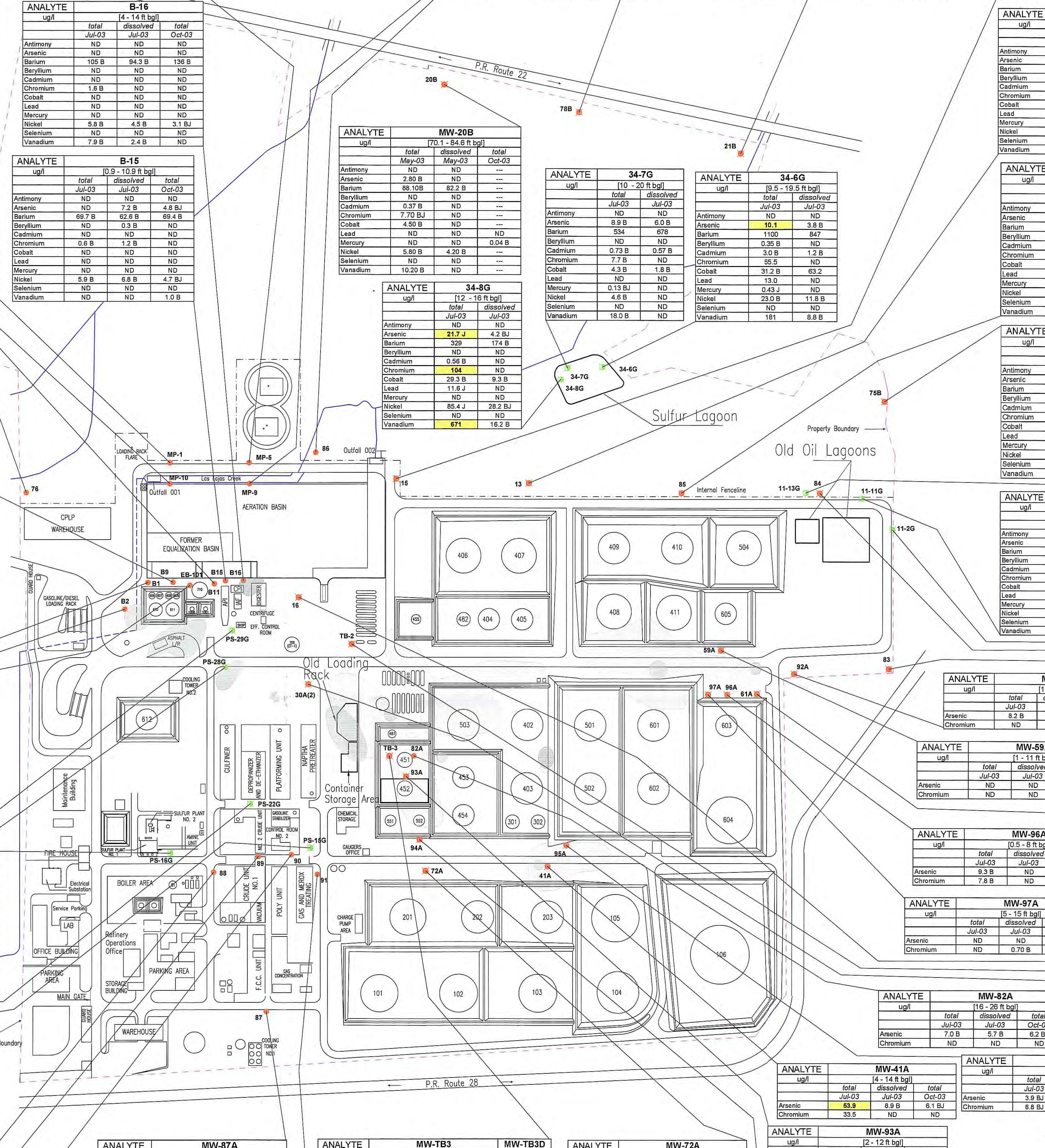
ANALYTE	MW-72A		
ug/l	[2 - 17 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	53.6 B	45.3 B	77.9 B
Beryllium	0.28 B	0.13 B	ND
Cadmium	0.36 B	ND	ND
Chromium	1.2 BJ	ND	1.6 B
Cobalt	1.3 B	ND	3.0 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	2.1 B	2.3 B	ND
Selenium	ND	ND	ND
Vanadium	2.5 B	1.3 B	3.7 B

ANALYTE	MW-88A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	---	ND
Chromium	ND	---	ND
Selenium	ND	---	ND

ANALYTE	MW-89A		
ug/l	[5.3 - 15.3 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	7.1 B	8.4 B	**11.4 J**
Chromium	ND	1.1 B	ND
Selenium	ND	3.3 B	ND

ANALYTE	MW-90A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	5.4 BJ
Chromium	0.8 B	ND	ND
Selenium	ND	ND	ND

ANALYTE	MW-91A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	8.1 B	7.5 B	**24.4**
Chromium	5.5 B	4.4 B	11.6
Selenium	5	3.8 B	ND



NOTES

1. Detections above groundwater screening levels are highlighted and bolded.
2. ND - not detected
3. J - estimated value
4. --- not analyzed (as per Work Plan)
5. B - concentration is between the instrument detection limit and contract required detection limit.
6. R - data rejected based on data validation.
7. Depth of screened interval provided for each well.
8. Groundwater screening levels are presented below. MCLs in bold. Other screening levels in italics.

ANALYTE	MCL or RBSL
Metals (ug/l)	
Antimony	**6**
Arsenic	**10**
Barium	**2000**
Beryllium	**4**
Cadmium	**5**
Chromium	**100**
Cobalt	*730*
Lead	**15**
Mercury	**2**
Nickel	*730*
Selenium	**50**
Vanadium	*260*

LEGEND

- Groundwater Monitoring Location
- Direct-push Groundwater Sampling Location
- Free Phase Hydrocarbon Plume-Upper Zone, Sep 2003
- Free Phase Hydrocarbon Plume-Lower Zone, Sep 2003

450 0 450
Scale feet

Scale	Date	Figure 5-2
1/2400	Jan 2004	**Metal Concentrations in Groundwater**
ANDERSON - MULHOLLAND & ASSOCIATES, INC. WHITE PLAINS, NEW YORK SAN JUAN, PUERTO RICO		Caribbean Petroleum Refining, LP Bayamon, Puerto Rico

ANALYTE	B-11		
ug/l	[0.7 - 10.7 ft bgl]		
	total	*dissolved*	*total*
	Jul-03	*Jul-03*	*Oct-03*
Antimony	ND	ND	ND
Arsenic	ND	ND	**36.9 J**
Barium	71.4 B	74.3 B	426
Beryllium	ND	ND	0.92 BJ
Cadmium	ND	ND	1.0 BJ
Chromium	3.2 B	ND	**139**
Cobalt	2.4 B	1.7 B	86.2 J
Lead	ND	ND	**67.8 J**
Mercury	ND	ND	0.82 B
Nickel	4.9 B	2.2 B	90.7 J
Selenium	3.2 B	ND	7.2
Vanadium	6.7 B	ND	**492**

ANALYTE	MW-13A		MW-13-B2		MW-13-B2	
ug/l	[5 - 15 ft bgl]		[40.7 - 50.7 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Benzene	**11.8**	0.34 J	ND	ND	---	ND
Ethylbenzene	62.1	2.4	0.9 J	ND	---	ND
MTBE	4.5	2.7	2.4	3.6	---	3.6
Xylene(total)	4.4	0.93 J	1.4	ND	---	ND
3&4-Methylphenol	3.3 J	ND	ND	ND	---	ND
2-Methylnaphthalene	14.6	ND	ND	ND	---	ND
Naphthalene	**37.6**	5.4	ND	ND	---	ND

ANALYTE	34-8G	
ug/l	[12 - 16 ft bgl]	
	total	*dissolved*
	Jul-03	*Jul-03*
Antimony	ND	ND
Arsenic	**21.7 J**	4.2 BJ
Barium	329	174 B
Beryllium	ND	ND
Cadmium	0.56 B	ND
Chromium	**104**	ND
Cobalt	29.3 B	9.3 B
Lead	11.6 J	ND
Mercury	ND	ND
Nickel	85.4 J	28.2 BJ
Selenium	ND	ND
Vanadium	**671**	16.2 B

ANALYTE	34-6G	
ug/l	[9.5 - 19.5 ft bgl]	
	total	*dissolved*
	Jul-03	*Jul-03*
Antimony	ND	ND
Arsenic	**10.1**	3.8 B
Barium	1100	847
Beryllium	0.35 B	ND
Cadmium	3.0 B	1.2 B
Chromium	55.5	ND
Cobalt	31.2 B	63.2
Lead	13.0	ND
Mercury	0.43 J	ND
Nickel	23.0 B	11.8 B
Selenium	ND	ND
Vanadium	181	8.8 B

ANALYTE	11-13G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	7.8 J
Chlorobenzene	0.26 J
Methylene Chloride	**6.0**
Toluene	0.42 J
Dibenzofuran	0.80 J
Fluorene	0.57 J

ANALYTE	MW-84A		MW-84-B2	
ug/l	[5 - 15 ft bgl]		[41.9 - 51.9 ft bgl]	
	May-03	Oct-03	May-03	Oct-03
Acetone	21.4	ND	ND	ND
Benzene	0.40 J	0.41 J	ND	ND
Carbon disulfide	ND	1.7 J	ND	ND
cis-1,2-Dichloroethene	ND	ND	2.9	18.4
trans-1,2-Dichloroethene	ND	ND	0.8 J	5.9
MTBE	ND	ND	9.9	8.9
Tetrachloroethene	ND	ND	ND	1.2
Trichloroethene	ND	ND	**12.9 J**	**68.7**
Vinyl Chloride	ND	ND	ND	1.3
3&4-Methylphenol	1.9 J	ND	ND	ND
Acenapthene	0.7 J	ND	ND	ND
Dibenzofuran	1.5 J	ND	ND	ND
Flourene	2.1 J	1.2 J	ND	ND
2-Methylnaphthalene	5.7	ND	ND	ND
Naphthalene	**11.1**	ND	ND	ND
Phenanthrene	3.0	ND	ND	ND

ANALYTE	B-2	
ug/l	[3.2 - 13.2 ft bgl]	
	Jul-03	Oct-03
Acetone	16.5	ND
Benzene	**31.2**	**71.2**
Ethylbenzene	10.5	35.1
MTBE	517 J	652
Toluene	3.0	6.6
Xylene (total)	3.4	8.4
Fluorene	ND	0.84 J
2-Methylnaphthalene	7.6	36.9
Naphthalene	**52.7**	**174**

ANALYTE	PS-28G	PS-28GD
ug/l	[9 - 14 ft bgl]	(duplicate)
	Jul-03	Jul-03
Acetone	60.3 J	---
2-Butanone (MEK)	12.2 J	---
MTBE	5.4	---
Chrysene	**46.2 J**	5.5 J
Fluorene	**855 J**	105
2-Methylnaphthalene	**6100 J**	766 J
Phenanthrene	828 J	92.0 J
Pyrene	162 J	14.0 J

ANALYTE	11-2G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	6.0 J
Benzene	**6.6**
Carbon disulfide	2.6 J
Chloromethane	0.45 J
Ethylbenzene	0.28 J
Xylene (total)	1.7
Acenaphthene	2.3 J
Benzo(a)pyrene	**0.61 J**
Carbazole	3.1 J
Chrysene	2.9 J
Fluorene	5.4 J
2-Methylnaphthalene	7.6 J
Naphthalene	5.7 J
Phenanthrene	26.4 J
Pyrene	4.9 J

ANALYTE	PS-28G	
ug/l	[9 - 14 ft bgl]	
	total	*dissolved*
	Jul-03	*Jul-03*
Antimony	ND	ND
Arsenic	**55.4**	ND
Barium	**3590**	622
Beryllium	**10.4**	ND
Cadmium	ND	ND
Chromium	**1130**	ND
Cobalt	160	1.6 B
Lead	**170**	ND
Mercury	ND	0.12 BJ
Nickel	297 J	3.6 BJ
Selenium	29.4 J	ND
Vanadium	**2850**	ND

ANALYTE	MW-30A(2)	
ug/l	[3 - 13 ft bgl]	
	May-03	Oct-03
Acetone	54.3	ND
Benzene	**113**	**114**
2-Butanone	30.3	ND
Ethylbenzene	81.8	110
MIBK	12.9	ND
Toluene	16.1	10.2
Xylene(total)	125	202
Fluorene	ND	0.65 J
2-Methylnaphthalene	11.9	36.4
Naphthalene	**82.4**	**122**

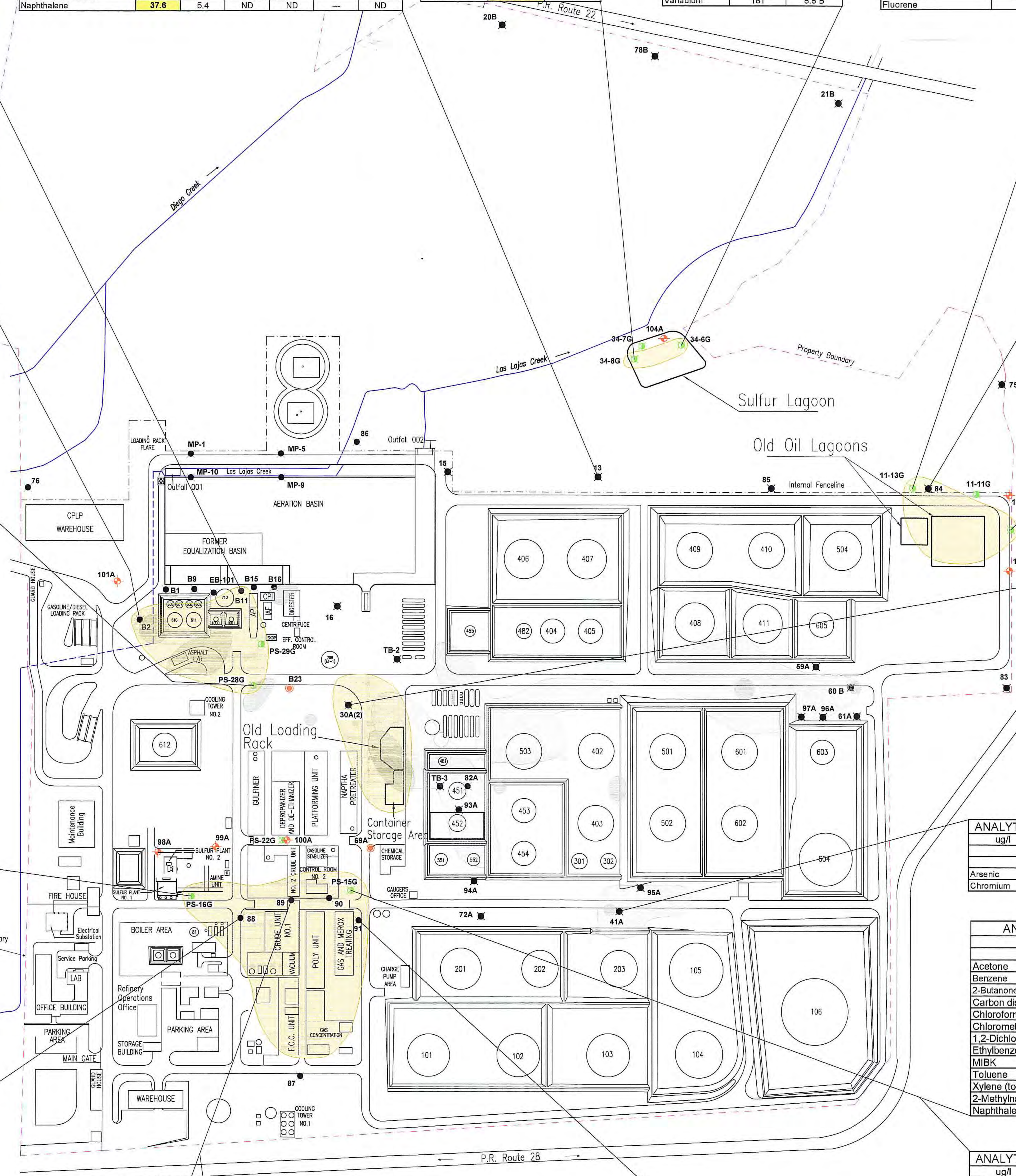
ANALYTE	MW-30-A(2)		
ug/l	[3 - 13 ft bgl]		
	total	*dissolved*	*total*
	May-03	*May-03*	*Oct-03*
Antimony	ND	3.9 B	ND
Arsenic	**16.5**	**16.7**	**33.5 J**
Barium	377	390	600
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.3 BJ
Chromium	ND	ND	0.85 BJ
Cobalt	1.2 B	1.7 B	1.5 B
Lead	5.9	4.4	2.8 B
Mercury	ND	ND	ND
Nickel	ND	ND	5.6 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	PS-16G
ug/l	[15 - 20 ft bgl]
	Jul-03
Acetone	16.8 J
Ethylbenzene	80.7
Xylene (total)	19.7
Acenaphthene	11.4 J
Anthracene	1.4 J
Fluorene	14.0
2-Methylnaphthalene	**511 J**
Naphthalene	**358 J**
Phenanthrene	17.2

ANALYTE	MW-41A		
ug/l	[4 - 14 ft bgl]		
	total	*dissolved*	*total*
	Jul-03	*Jul-03*	*Oct-03*
Arsenic	**53.9**	8.9 B	6.1 BJ
Chromium	33.5	ND	ND

ANALYTE	PS-16G	
ug/l	[15 - 20 ft bgl]	
	total	*dissolved*
	Jul-03	*Jul-03*
Antimony	ND	ND
Arsenic	**30.0**	ND
Barium	489	1.5 B
Beryllium	0.79 B	ND
Cadmium	1.7 B	ND
Chromium	37.2	ND
Cobalt	7.4 B	ND
Lead	2.7 BJ	ND
Mercury	0.12 BJ	ND
Nickel	30.8 B	ND
Selenium	ND	ND
Vanadium	79.0	ND

ANALYTE	PS-15G
ug/l	[9 - 14 ft bgl]
	Jul-03
Acetone	75.0 J
Benzene	**309**
2-Butanone (MEK)	32.3
Carbon disulfide	2.6 J
Chloroform	1.4
Chloromethane	1.0
1,2-Dichloroethane	**6.9 J**
Ethylbenzene	143
MIBK	12.1
Toluene	53.1
Xylene (total)	633
2-Methylnaphthalene	13.5 J
Naphthalene	**18.1 J**



ANALYTE	MW-88A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Benzene	4.7	**8.3**
Chloroform	3.5	ND
Ethylbenzene	3.7	6.8
MTBE	16.3	32.2
Methylene Chloride	0.43 J	ND
Toluene	0.29 J	ND
Xylene (total)	2.9	3.9
Acenaphthene	ND	1.9 J
Fluorene	ND	1.3 J
2-Methylnaphthalene	2.1	14.8
Naphthalene	ND	5.9
Phenanthrene	ND	0.97 J

ANALYTE	MW-89A	
ug/l	[5.3 - 15.3 ft bgl]	
	Jul-03	Oct-03
Acetone	33.8	ND R
Benzene	0.61 J	0.86 J
Carbon disulfide	0.68 J	ND
Chloroform	0.46 J	ND
MTBE	0.30 J	ND
Methylene Chloride	1.2 J	ND
3&4-Methylphenol	ND	1.8 J
Acenaphthene	0.84 J	0.94 J
Carbazole	ND	0.80 J
Dibenzofuran	ND	0.81 J
Fluorene	2.3	2.2
2-Methylnaphthalene	22.6	14.3
Naphthalene	**16.9**	**12.3**
Phenanthrene	0.61 J	0.82 J

ANALYTE	MW-89A		
ug/l	[5.3 - 15.3 ft bgl]		
	total	*dissolved*	*total*
	Jul-03	*Jul-03*	*Oct-03*
Arsenic	7.1 B	8.4 B	**11.4 J**
Chromium	ND	1.1 B	ND
Selenium	ND	3.3 B	ND

ANALYTE	MW-91A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Acetone	258	ND R
Benzene	**2910**	**1830**
Ethylbenzene	195	390
MIBK	83.6	ND
Toluene	397	57.4
Xylene (total)	2220	922
2,4-Dimethylphenol	113	84.0
2-Methylphenol	225	13.0
3&4-Methylphenol	ND	55.4
Phenol	ND	16.1
Acenaphthene	ND	0.74 J
Fluorene	1.2 J	0.75 J
2-Methylnaphthalene	68.3	47.3
Naphthalene	**168**	**166**
Phenanthrene	0.85 J	ND

ANALYTE	MW-91A		
ug/l	[4 - 14 ft bgl]		
	total	*dissolved*	*total*
	Jul-03	*Jul-03*	*Oct-03*
Arsenic	8.1 B	7.5 B	**24.4**
Chromium	5.5 B	4.4 B	11.6
Selenium	5	3.8 B	ND

ANALYTE	PS-15G	
ug/l	[9 - 14 ft bgl]	
	total	*dissolved*
	Jul-03	*Jul-03*
Antimony	ND	ND
Arsenic	**14.4**	ND
Barium	690	312
Beryllium	1.1 B	ND
Cadmium	ND	ND
Chromium	51.8	ND
Cobalt	43.8 B	18.1 BJ
Lead	**17.0**	ND
Mercury	ND	ND
Nickel	35.0 B	11.4 B
Selenium	3.4 BJ	ND
Vanadium	117	ND

NOTES

1. Detections above groundwater screening levels are highlighted and bolded.
2. ND - not detected
3. J - estimated value
4. --- not analyzed (as per Work Plan)
5. B - concentration is between the instrument detection limit and contract required detection limit.
6. R - data rejected based on data validation.
7. Depth of screened interval provided for each well.
8. Groundwater screening levels are presented below. MCLs in bold. Other screening levels in italics. NA - not available.

ANALYTE	MCL or RBSL
VOCs (ug/l)	
Acetone	*610*
Benzene	**5**
2-Butanone (MEK)	*1,900*
Carbon disulfide	*1,000*
Chlorobenzene	**100**
Chloroform	**80**
Chloromethane	*2.1*
cis-1,2-Dichloroethene	**70**
trans-1,2-Dichloroethene	**100**
1,2-Dichloroethane	**5**
Ethylbenzene	**700**
Methyl Tert Butyl Ether (MTBE)	NA
4-Methyl-2-Pentanone (MIBK)	*140*
Methylene Chloride	**5**
Tetrachloroethene	**5**
Toluene	**1,000**
Trichloroethene	**5**
Vinyl chloride	**2**
Xylene (total)	**10,000**
BNAs (ug/l)	
2,4-Dimethylphenol	*730*
2-Methylphenol	*1,800*
3&4-Methylphenol	*180*
Phenol	*11,000*
Acenaphthene	*370*
Anthracene	*1,800*
Acenaphthylene	NA
Benzo(a)pyrene	**0.2**
Carbazole	*3.3*
Chrysene	*9.2*
Dibenzofuran	*24*
Di-n-butyl phthalate	*3,700*
Diethyl phthalate	*29,000*
bis(2-Ethylhexyl)phthalate	**6.0**
Fluorene	*240*
2-Methylnaphthalene	*120*
Naphthalene	*6.5*
Phenanthrene	NA
Pyrene	*180*
Metals (ug/l)	
Antimony	**6**
Arsenic	**10**
Barium	**2000**
Beryllium	**4**
Cadmium	**5**
Chromium	**100**
Cobalt	*730*
Lead	**15**
Mercury	**2**
Nickel	*730*
Selenium	**50**
Vanadium	*260*

LEGEND

- Existing Wells
- Proposed Wells
- Groundwater Monitoring Location
- Direct-push Groundwater Sampling Location
- Free Phase Hydrocarbon Plume-Upper Zone, Sep 2003
- Free Phase Hydrocarbon Plume-Lower Zone, Sep 2003
- Estimated Extent of VOC, BNA and/or Metal Groundwater Plume Above Screening Levels.

500 0 500
Scale feet

Scale	Date
1/2400	Jan 2004

ANDERSON - MULHOLLAND & ASSOCIATES, INC.
WHITE PLAINS, NEW YORK
SAN JUAN, PUERTO RICO

Figure 6-1

Groundwater Plumes in Overburden Water-Bearing Zone

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North

ANALYTE	MP-5A		MP-5B2		MP-5B2	
ug/l	[15.5 - 18.5 ft bgl]		[50.3 - 60.3 ft bgl]		(duplicate)	
	Jul-03	Oct-03	Jul-03	Oct-03	Jul-03	Oct-03
Acetone	ND	ND	ND	4.3 J	ND	---
Chloroform	0.86 J	1.1	ND	ND	ND	---
cis-1,2-Dichloroethene	ND	ND	0.98 J	1.6	0.68 J	---
MTBE	ND	ND	11.4	5.7	6.6	---
Trichloroethene	ND	ND	3.7	1.3	2.8	---
1,2-Dichlorobenzene	ND	0.88 J	ND	ND	ND	---

ANALYTE	MW-86A	
ug/l	[11 - 21 ft bgl]	
	Jul-03	Oct-03
MTBE	3.5	ND
BNA	ND	ND

ANALYTE	MW-20B	
ug/l	[70.1 - 84.6 ft bgl]	
	May-03	Oct-03
VOC	ND	ND

ANALYTE	MW-78B	
ug/l	[82 - 92 ft bgl]	
	May-03	Oct-03
VOC	ND	ND

ANALYTE	MW-21B	
ug/l	[39.1 - 54.1 ft bgl]	
	May-03	Oct-03
Carbon disulfide	1.4 J	ND
MTBE	15.8	ND

ANALYTE	MW-15A		MW-15-B2		MW-15-B2D	
ug/l	[9 - 19 ft bgl]		[37.8 - 47.8 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Carbon disulfide	1.8 J	1.7 J	ND	ND	1.1 J	---
MTBE	36.3	25.1	9.2	ND	9.2	---
BNA	ND	ND	ND	ND	ND	---

ANALYTE	MW-13A		MW-13-B2		MW-13-B2	
ug/l	[5 - 15 ft bgl]		[40.7 - 50.7 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Benzene	**11.8**	0.34 J	ND	ND	---	ND
Ethylbenzene	62.1	2.4	0.9 J	ND	---	ND
MTBE	4.5	2.7	2.4	3.6	---	3.6
Xylene(total)	4.4	0.93 J	1.4	ND	---	ND
3&4-Methylphenol	3.3 J	ND	ND	ND	---	ND
2-Methylnaphthalene	14.6	ND	ND	ND	---	ND
Naphthalene	**37.6**	5.4	ND	ND	---	ND

ANALYTE	MW-16A		MW-16-B2		MW-16-B2D	
ug/l	[10 - 25 ft bgl]		[40 - 50 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Carbon disulfide	ND	ND	3.9 J	ND	---	ND
Chloroform	ND	ND	2	ND	---	ND
1,2-Dichloropropane	ND	ND	1.7	ND	---	ND
MTBE	3.5	3.1	6.5	6.5	---	6.6
BNA	ND	ND	ND	ND	---	ND

ANALYTE	MP-9		MP-9D	
ug/l	[2 - 12 ft bgl]		(duplicate)	
	Jul-03	Oct-03	Jul-03	Oct-03
Chlorobenzene	0.24 J	ND	---	ND
MTBE	1.0	0.96 J	---	0.91 J
BNA	ND	ND	---	ND

ANALYTE	B-16	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
MTBE	3.3	4.0
BNA	ND	ND

ANALYTE	B-15	
ug/l	[0.9 - 10.9 ft bgl]	
	Jul-03	Oct-03
Acetone	ND	12.6
MTBE	4.5	2.6
Di-n-butyl phthalate	ND	1.1 J

ANALYTE	34-6G
ug/l	[9.5 - 19.5 ft bgl]
	Jul-03
Acetone	7.5 J
bis(2-Ethylhexyl)phthalate	2.9 J

ANALYTE	34-7G
ug/l	[10 - 20 ft bgl]
	Jul-03
Acetone	15.0 J
Chloromethane	0.56 J
Toluene	0.33 J
BNA	ND

ANALYTE	34-8G
ug/l	[12 - 16 ft bgl]
	Jul-03
Acetone	19.8 J
Carbon disulfide	2.0
Chrysene	0.82 J
Diethyl phthalate	1.4 J
Pyrene	1.3 J

ANALYTE	MP-1	
ug/l	[18.8 - 21.8 ft bgl]	
	Jul-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	MP-10	
ug/l	[1.4 - 11.4 ft bgl]	
	Jul-03	Oct-03
Acetone	6.6 J	32.6
2-Butanone (MEK)	4.6 J	ND R
Carbon disulfide	0.49 J	ND
MTBE	0.56 J	ND
BNA	ND	ND

ANALYTE	EB-101	
ug/l	[12 - 22 ft bgl]	
	Jul-03	Oct-03
Acetone	7.6 J	ND R
MTBE	3.0	2.8
Acenaphthene	0.65 J	ND

ANALYTE	MW-76A		MW-76B2	
ug/l	[4 - 14 ft bgl]		[45 - 55 ft bgl]	
	Jul-03	Oct-03	Jul-03	Oct-03
MTBE	ND	ND	0.77 J	0.78 J
BNA	ND	ND	ND	ND

ANALYTE	MW- 85A		MW- 85-B2	
ug/l	[3.8 - 13.8 ft bgl]		[45 - 55 ft bgl]	
	May-03	Oct-03	May-03	Oct-03
Acetone	ND	ND	18.9	ND
Chloroform	0.8 J	ND	ND	ND
MTBE	ND	ND	ND	6.0
BNA	ND	ND	ND	ND

ANALYTE	MW-75B	
ug/l	[45 - 55 ft bgl]	
	May-03	Oct-03
1,2-Dichloroethane	0.8 J	ND
cis-1,2-Dichloroethene	45.3	**71.7**
trans-1,2-Dichloroethene	6.7	10.4
MTBE	7.6	6.0
Tetrachloroethene	0.8 J	1.5
Trichloroethene	**83.8**	**106**
Vinyl Chloride	**3.1**	**5.8**

ANALYTE	MW-84A		MW-84-B2	
ug/l	[5 - 15 ft bgl]		[41.9 - 51.9 ft bgl]	
	May-03	Oct-03	May-03	Oct-03
Acetone	21.4	ND	ND	ND
Benzene	0.40 J	0.41 J	ND	ND
Carbon disulfide	ND	1.7 J	ND	ND
cis-1,2-Dichloroethene	ND	ND	2.9	18.4
trans-1,2-Dichloroethene	ND	ND	0.8 J	5.9
MTBE	ND	ND	9.9	8.9
Tetrachloroethene	ND	ND	ND	1.2
Trichloroethene	ND	ND	**12.9 J**	**68.7**
Vinyl Chloride	ND	ND	ND	1.3
3&4-Methylphenol	1.9 J	ND	ND	ND
Acenapthene	0.7 J	ND	ND	ND
Dibenzofuran	1.5 J	ND	ND	ND
Flourene	2.1 J	1.2 J	ND	ND
2-Methylnaphthalene	5.7	ND	ND	ND
Naphthalene	**11.1**	ND	ND	ND
Phenanthrene	3.0	ND	ND	ND

ANALYTE	11-11G
ug/l	[12 - 17 ft bgl]
	Jul-03
VOC	ND
Butyl benzyl phthalate	1.0 J

ANALYTE	11-13G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	7.8 J
Chlorobenzene	0.26 J
Methylene Chloride	**6.0**
Toluene	0.42 J
Dibenzofuran	0.80 J
Fluorene	0.57 J

ANALYTE	11-2G
ug/l	[12 - 17 ft bgl]
	Jul-03
Acetone	6.0 J
Benzene	**6.6**
Carbon disulfide	2.6 J
Chloromethane	0.45 J
Ethylbenzene	0.28 J
Xylene (total)	1.7
Acenaphthene	2.3 J
Benzo(a)pyrene	**0.61 J**
Carbazole	3.1 J
Chrysene	2.9 J
Fluorene	5.4 J
2-Methylnaphthalene	7.6 J
Naphthalene	5.7 J
Phenanthrene	26.4 J
Pyrene	4.9 J

ANALYTE	MW-TB-2	
ug/l	[40.5 - 50.5 ft bgl]	
	May-03	Oct-03
MTBE	3.5	2.9
BNA	ND	ND

ANALYTE	MW-TB-3		MW-TB-3D	
ug/l	[39 - 49 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03
1,2-Dichloroethane	0.7 J	ND	---	ND
MTBE	7.9	5.3	---	5.2
BNA	ND	ND	---	ND

ANALYTE	MW-83A		MW-83-B1		MW-83-B2		MW-83-B2D	
ug/l	[1.2 - 11.2 ft bgl]		[27-37 ft bgl]		[50.9-60.9 ft bgl]		(duplicate)	
	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03	May-03	Oct-03
Acetone	16.7	ND	ND	ND	ND	ND	ND	---
Chloroform	ND	ND	0.6 J	1.3	0.4 J	18.1	ND	---
cis-1,2-Dichloroethene	ND	ND	20	15.6	15.1	2.2	15.2	---
trans-1,2-Dichloroethene	ND	ND	4.3	2.2	2.5	ND	2.4	---
MTBE	ND	ND	2.8	2.2	4.4	5.5	4.3	---
Tetrachloroethene	ND	ND	3.6	3.4	2.5	2.1	2.3	---
Trichloroethene	ND	ND	**154 J**	**138**	**127 J**	**122**	**126 J**	---
Vinyl Chloride	ND	ND	**2.6**	ND	1.2	ND	1.1	---
Phenol	1.4 J	ND	ND	ND	ND	ND	ND	---
Acenaphthene	2.9	1.2 J	ND	ND	ND	ND	ND	---
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	1.2 J	ND	ND	---
Fluorene	1.3 J	0.56 J	ND	ND	ND	ND	ND	---
2-Methylnaphthalene	ND	0.60 J	0.61 J	ND	ND	ND	ND	---

ANALYTE	MW-60B	MW-60BD
ug/l	[22.5 - 27.5 ft bgl]	(duplicate)
	Dec-03	Dec-03
Benzene	0.67 J	0.64 J
MTBE	12	13.4
Vinyl Chloride	**2.1**	**2.3**

ANALYTE	MW-61A	
ug/l	[2 - 17 ft bgl]	
	May-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	MW-30A(2)	
ug/l	[3 - 13 ft bgl]	
	May-03	Oct-03
Acetone	54.3	ND
Benzene	**113**	**114**
2-Butanone	30.3	ND
Ethylbenzene	81.8	110
MIBK	12.9	ND
Toluene	16.1	10.2
Xylene(total)	125	202
Fluorene	ND	0.65 J
2-Methylnaphthalene	11.9	36.4
Naphthalene	**82.4**	**122**

ANALYTE	MW-72A	
ug/l	[2 - 17 ft bgl]	
	May-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	B-9	
ug/l	[2.7 - 12.7 ft bgl]	
	Jul-03	Oct-03
VOC	ND	ND
BNA	ND	ND

ANALYTE	B-2	
ug/l	[3.2 - 13.2 ft bgl]	
	Jul-03	Oct-03
Acetone	16.5	ND
Benzene	**31.2**	**71.2**
Ethylbenzene	10.5	35.1
MTBE	517 J	652
Toluene	3.0	6.6
Xylene (total)	3.4	8.4
Fluorene	ND	0.84 J
2-Methylnaphthalene	7.6	36.9
Naphthalene	**52.7**	**174**

ANALYTE	B-1	
ug/l	[2 - 12 ft bgl]	
	Jul-03	Oct-03
Carbon disulfide	ND	3.7
MTBE	0.32 J	ND
BNA	ND	ND

ANALYTE	B-11	
ug/l	[0.7 - 10.7 ft bgl]	
	Jul-03	Oct-03
Acetone	5.2 J	ND
Carbon disulfide	ND	2.1
Chlorobenzene	0.95 J	2.0
MTBE	0.53 J	ND
Acenaphthene	ND	3.4
Anthracene	ND	0.60 J
Di-n-butyl phthalate	ND	1.4 J
Fluorene	ND	4.5
2-Methylnaphthalene	ND	1.6 J
Phenanthrene	ND	1.2 J
Pyrene	ND	0.66 J

ANALYTE	PS-29G
ug/l	[9 - 14 ft bgl]
	Jul-03
Acetone	22.0 J
Benzene	1.3
2-Butanone (MEK)	7.7 J
Carbon disulfide	0.48 J
Chlorobenzene	1.1
MTBE	53.3
Xylene (total)	0.39 J
bis(2-Ethylhexyl)phthalate	**20.8**
2-Methylnaphthalene	**122**
Naphthalene	**81.7**
Phenanthrene	4.9

ANALYTE	PS-28G	PS-28GD
ug/l	[9 - 14 ft bgl]	(duplicate)
	Jul-03	Jul-03
Acetone	60.3 J	---
2-Butanone (MEK)	12.2 J	---
MTBE	5.4	---
Chrysene	**46.2 J**	5.5 J
Fluorene	**855 J**	105
2-Methylnaphthalene	**6100 J**	766 J
Phenanthrene	828 J	92.0 J
Pyrene	162 J	14.0 J

ANALYTE	PS-16G
ug/l	[15 - 20 ft bgl]
	Jul-03
Acetone	16.8 J
Ethylbenzene	80.7
Xylene (total)	19.7
Acenaphthene	11.4 J
Anthracene	1.4 J
Fluorene	14.0
2-Methylnaphthalene	**511 J**
Naphthalene	**358 J**
Phenanthrene	17.2

ANALYTE	PS-22G	PS-22GD
ug/l	[4 - 14 ft bgl]	(duplicate)
	Jul-03	Jul-03
Acetone	24.5 J	ND
Benzene	ND	0.36 J
Carbon disulfide	0.85 J	5.0 J
Ethylbenzene	ND	0.27 J
MTBE	1.7	2.6
Xylene (total)	0.27 J	0.76 J
BNA	ND	ND

ANALYTE	MW-88A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Benzene	4.7	**8.3**
Chloroform	3.5	ND
Ethylbenzene	3.7	6.8
MTBE	16.3	32.2
Methylene Chloride	0.43 J	ND
Toluene	0.29 J	ND
Xylene (total)	2.9	3.9
Acenaphthene	ND	1.9 J
Fluorene	ND	1.3 J
2-Methylnaphthalene	2.1	14.8
Naphthalene	ND	5.9
Phenanthrene	ND	0.97 J

ANALYTE	MW-89A	
ug/l	[5.3 - 15.3 ft bgl]	
	Jul-03	Oct-03
Acetone	33.8	ND R
Benzene	0.61 J	0.86 J
Carbon disulfide	0.68 J	ND
Chloroform	0.46 J	ND
MTBE	0.30 J	ND
Methylene Chloride	1.2 J	ND
3&4-Methylphenol	ND	1.8 J
Acenaphthene	0.84 J	0.94 J
Carbazole	ND	0.80 J
Dibenzofuran	ND	0.81 J
Fluorene	2.3	2.2
2-Methylnaphthalene	22.6	14.3
Naphthalene	**16.9**	**12.3**
Phenanthrene	0.61 J	0.82 J

ANALYTE	MW-90A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Carbon disulfide	ND	6.3
Chloroform	13.6	ND
BNA	ND	ND

ANALYTE	MW-87A	
ug/l	[9 - 19 ft bgl]	
	Jul-03	Oct-03
Acetone	5.6 J	ND
BNA	ND	ND

ANALYTE	MW-91A	
ug/l	[4 - 14 ft bgl]	
	Jul-03	Oct-03
Acetone	258	ND R
Benzene	**2910**	**1830**
Ethylbenzene	195	390
MIBK	83.6	ND
Toluene	397	57.4
Xylene (total)	2220	922
2,4-Dimethylphenol	113	84.0
2-Methylphenol	225	13.0
3&4-Methylphenol	ND	55.4
Phenol	ND	16.1
Acenaphthene	ND	0.74 J
Fluorene	1.2 J	0.75 J
2-Methylnaphthalene	68.3	47.3
Naphthalene	**168**	**166**
Phenanthrene	0.85 J	ND

ANALYTE	PS-15G
ug/l	[9 - 14 ft bgl]
	Jul-03
Acetone	75.0 J
Benzene	**309**
2-Butanone (MEK)	32.3
Carbon disulfide	2.6 J
Chloroform	1.4
Chloromethane	1.0
1,2-Dichloroethane	**6.9 J**
Ethylbenzene	143
MIBK	12.1
Toluene	53.1
Xylene (total)	633
2-Methylnaphthalene	13.5 J
Naphthalene	**18.1 J**

NOTES

1. Detections above groundwater screening levels are highlighted and bolded.
2. ND - not detected
3. J - estimated value
4. --- not analyzed
5. R - rejected
6. Depth of screened interval provided for each well.
7. Groundwater screening levels are presented below. MCLs in bold. Other screening levels in italics. NA - not available.

ANALYTE	MCL or RBSL
VOCs (ug/l)	
Acetone	*610*
Benzene	**5**
2-Butanone (MEK)	*1,900*
Carbon disulfide	*1,000*
Chlorobenzene	**100**
Chloroform	**80**
Chloromethane	*2.1*
cis-1,2-Dichloroethene	**70**
trans-1,2-Dichloroethene	**100**
1,2-Dichloroethane	**5**
Ethylbenzene	**700**
Methyl Tert Butyl Ether (MTBE)	NA
4-Methyl-2-Pentanone (MIBK)	*140*
Methylene Chloride	**5**
Tetrachloroethene	**5**
Toluene	**1,000**
Trichloroethene	**5**
Vinyl chloride	**2**
Xylene (total)	**10,000**
BNAs (ug/l)	
2,4-Dimethylphenol	*730*
2-Methylphenol	*1,800*
3&4-Methylphenol	*180*
Phenol	*11,000*
Acenaphthene	*370*
Anthracene	*1,800*
Acenaphthylene	NA
Benzo(a)pyrene	**0.2**
Carbazole	*3.3*
Chrysene	*9.2*
Dibenzofuran	*24*
Di-n-butyl phthalate	*3,700*
Diethyl phthalate	*29,000*
bis(2-Ethylhexyl)phthalate	**6.0**
Fluorene	*240*
2-Methylnaphthalene	*120*
Naphthalene	*6.5*
Phenanthrene	NA
Pyrene	*180*

LEGEND

- Groundwater Monitoring Location
- Direct-push Groundwater Sampling Location
- Free Phase Hydrocarbon Plume-Upper Zone, Sep 2003
- Free Phase Hydrocarbon Plume-Lower Zone, Sep 2003
- TCE Plume, Oct 2003 (above MCL of 5 ug/l)
- Vinyl Chloride Plume, Oct 2003 (above MCL of 2 ug/l)
- 1,2 - DCE Plume, Oct 2003 (above MCL of 70 ug/l)

500 0 500
Scale feet

Scale	Date
1/2400	Jan 2004

ANDERSON - MULHOLLAND & ASSOCIATES, INC.
WHITE PLAINS, NEW YORK
SAN JUAN, PUERTO RICO

Figure 6-2
Chlorinated Hydrocarbon Plume Northeast Study Area

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

North

ANALYTE	MP-5A			MP-5B2			MP-5B2D	
ug/l	[15.5 - 18.5 ft bgl]			[50.3 - 60.3 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03
Antimony	2.6 B	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	9.6 B	**10.7**	**20.2 J**	**10.6**	**11.9**
Barium	98.0 B	94.1 B	70.2 B	245	247	231	246	236
Beryllium	0.1 B	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	2.3 B	ND	ND
Chromium	2.3 B	ND	3.1 B	ND	ND	38.5	0.8 B	ND
Cobalt	14.3 B	13.9 B	10.7 B	3.9 B	3.4 B	11.6 B	3.6 B	3.2 B
Lead	2.2 B	ND	4.2 J	ND	ND	3.7 J	ND	ND
Mercury	0.1 BJ	ND	ND	0.2 BJ	0.1 BJ	ND	ND	0.1 BJ
Nickel	4.6 B	4.8 B	9.0 B	3.3 B	ND	18.3 B	ND	ND
Selenium	ND	ND	ND	2.8 B	2.2 B	ND	ND	ND
Vanadium	5.3 B	ND	0.63 B	1.2 B	ND	68.7	1.2 B	ND

ANALYTE	MP-9			MP-9D
ug/l	[2 - 12 ft bgl]			(duplicate)
	total	dissolved	total	total
	Jul-03	Jul-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND
Barium	247	249	274	283
Beryllium	ND	ND	ND	ND
Cadmium	ND	ND	ND	0.65 BJ
Chromium	ND	ND	ND	ND
Cobalt	18.6	19.5	20.2 BJ	20.4 BJ
Lead	ND	ND	ND	ND
Mercury	ND	ND	ND	ND
Nickel	5.2 B	4.4 B	5.7 BJ	5.5 BJ
Selenium	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND

ANALYTE	MW-86A		
ug/l	[11 - 21 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	1050	1120	1180
Beryllium	ND	ND	ND
Cadmium	0.7 B	0.6 B	6.8 J
Chromium	3.5 B	ND	ND
Cobalt	180	189	223
Lead	ND	ND	3.4 J
Mercury	ND	ND	ND
Nickel	53.2	54.3	63.3 J
Selenium	ND	ND	ND
Vanadium	5.5 B	ND	2.8 B

ANALYTE	MW-78B		
ug/l	[82 - 92 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	---	ND	---
Arsenic	---	ND	---
Barium	---	39.5 B	---
Beryllium	---	ND	---
Cadmium	---	ND	---
Chromium	---	4.6 BJ	---
Cobalt	---	ND	---
Lead	---	ND	ND
Mercury	1.4	ND	**2.3**
Nickel	---	2.0 B	---
Selenium	---	ND	---
Vanadium	---	ND	---

ANALYTE	MW-21B		
ug/l	[39.1 - 54.1 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	ND	ND	---
Barium	71.8 B	73.0 B	---
Beryllium	ND	ND	---
Cadmium	ND	ND	---
Chromium	11.8 R	28.9 R	---
Cobalt	ND	1.10 B	---
Lead	ND	ND	ND
Mercury	ND	**2.2**	**3.4**
Nickel	3.6 B	3.4 B	---
Selenium	ND	ND	---
Vanadium	ND	6.1 B	---

ANALYTE	MW-15A			MW-15B2			MW-15B2D	
ug/l	[9 - 19 ft bgl]			[9 - 19 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03
Antimony	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3.6 B	ND	ND	**17**	**16.8**	**15.2 J**	**18.1**	**18.7**
Barium	67.4 B	58.5 B	59.6 B	736	706	640	762	739
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	4.4 B	ND	ND	0.93 B	ND	2.6 BJ	0.89 B	ND
Cobalt	73.3	70.8	83.7	1.2 B	0.7 B	1.5 B	1.0 B	0.9 B
Lead	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	12.6 B	12.1 B	10.8 BJ	5.2 B	5.0 B	9.4 BJ	4.9 B	4.3 B
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	7.2 B	ND	1.6 B	ND	ND	0.74 B	ND	ND

NOTES

1. Detections above groundwater screening levels are highlighted and bolded.
2. ND - not detected
3. J - estimated value
4. --- not analyzed (as per Work Plan)
5. B - concentration is between the instrument detection limit and contract required detection limit.
6. R - data rejected based on data validation.
7. Depth of screened interval provided for each well.
8. Groundwater screening levels are presented below. MCLs in bold. Other screening levels in italics.

ANALYTE	MCL or RBSL
Metals (ug/l)	
Antimony	**6**
Arsenic	**10**
Barium	**2000**
Beryllium	**4**
Cadmium	**5**
Chromium	**100**
Cobalt	*730*
Lead	**15**
Mercury	**2**
Nickel	*730*
Selenium	**50**
Vanadium	*260*

ANALYTE	MP-1		
ug/l	[18.8 - 21.8 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	4.6 BJ
Barium	317	312	343
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	63.4	63.2	71.3
Lead	ND	ND	3.0 BJ
Mercury	ND	ND	ND
Nickel	8.8 B	7.7 B	9.5 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	0.95 B

ANALYTE	B-16		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	105 B	94.3 B	136 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	1.6 B	ND	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	5.8 B	4.5 B	3.1 BJ
Selenium	ND	ND	ND
Vanadium	7.9 B	2.4 B	ND

ANALYTE	MW-13A			MW-13B2			MW-13B2D
ug/l	[15 - 15 ft bgl]			[15 - 15 ft bgl]			(duplicate)
	total	dissolved	total	total	dissolved	total	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	4.8 B	7.9 B	**10.7 J**	**26.4**	**24.7**	**26.7 J**	**26.2 J**
Barium	482	483	336	589	591	504	498
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.81 B	ND	ND	ND	ND
Chromium	ND	ND	ND	2.0 B	ND	8.4 B	ND
Cobalt	9.6 B	10.7 B	10.7 B	1.0 B	ND	0.88 B	0.80 B
Lead	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND
Nickel	23.7 B	3.4 B	6.5 B	1.9 B	1.7 B	9.5 BJ	5.2 BJ
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	1.9 B	ND	0.80 B	ND

ANALYTE	MW-20B		
ug/l	[70.1 - 84.6 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	2.80 B	ND	---
Barium	88.10B	82.2 B	---
Beryllium	ND	ND	---
Cadmium	0.37 B	ND	---
Chromium	7.70 BJ	ND	---
Cobalt	4.50 B	ND	---
Lead	ND	ND	ND
Mercury	ND	ND	0.04 B
Nickel	5.80 B	4.20 B	---
Selenium	ND	ND	---
Vanadium	10.20 B	ND	---

ANALYTE	B-11		
ug/l	[0.7 - 10.7 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	**36.9 J**
Barium	71.4 B	74.3 B	426
Beryllium	ND	ND	0.92 BJ
Cadmium	ND	ND	1.0 BJ
Chromium	3.2 B	ND	**139**
Cobalt	2.4 B	1.7 B	86.2 J
Lead	ND	ND	**67.8 J**
Mercury	ND	ND	0.82 B
Nickel	4.9 B	2.2 B	90.7 J
Selenium	3.2 B	ND	7.2
Vanadium	6.7 B	ND	**492**

ANALYTE	MP-10		
ug/l	[1.4 - 11.4 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	4.4 B	4.8 B	ND
Barium	332	109 B	121 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	3.8 B	ND	ND
Cobalt	80.2	106	32.4 BJ
Lead	11.2	ND	3.0 BJ
Mercury	ND	ND	ND
Nickel	40.8	47.5	18.4 BJ
Selenium	ND	ND	ND
Vanadium	6.6 B	ND	3.4 B

ANALYTE	B-15		
ug/l	[0.9 - 10.9 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	7.2 B	4.8 BJ
Barium	69.7 B	62.6 B	69.4 B
Beryllium	ND	0.3 B	ND
Cadmium	ND	ND	ND
Chromium	0.6 B	1.2 B	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	5.9 B	6.8 B	4.7 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	1.0 B

ANALYTE	34-7G	
ug/l	[10 - 20 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	8.9 B	6.0 B
Barium	534	678
Beryllium	ND	ND
Cadmium	0.73 B	0.57 B
Chromium	7.7 B	ND
Cobalt	4.3 B	1.8 B
Lead	ND	ND
Mercury	0.13 BJ	ND
Nickel	4.6 B	ND
Selenium	ND	ND
Vanadium	18.0 B	ND

ANALYTE	34-6G	
ug/l	[9.5 - 19.5 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**10.1**	3.8 B
Barium	1100	847
Beryllium	0.35 B	ND
Cadmium	3.0 B	1.2 B
Chromium	55.5	ND
Cobalt	31.2 B	63.2
Lead	13.0	ND
Mercury	0.43 J	ND
Nickel	23.0 B	11.8 B
Selenium	ND	ND
Vanadium	181	8.8 B

ANALYTE	MW-85A			MW-85B2		
ug/l	[3.8 - 13.8 ft bgl]			[45 - 55 ft bgl]		
	total	dissolved	total	total	dissolved	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	**69.2**	**64.7**	**53.0 J**
Barium	229	254	168 B	719	696	580
Beryllium	0.24 B	ND	ND	0.15 B	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	2.5 B	ND	1.0 B
Cobalt	1.1 B	0.62 B	1.7 B	3.5 B	2.0 B	1.1 B
Lead	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	4.0 B	3.8 B	3.9 B	5.5 B	2.5 B	3.3 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	ND	1.1 B	ND	2.4 B	ND	1.1 B

ANALYTE	34-8G	
ug/l	[12 - 16 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**21.7 J**	4.2 BJ
Barium	329	174 B
Beryllium	ND	ND
Cadmium	0.56 B	ND
Chromium	**104**	ND
Cobalt	29.3 B	9.3 B
Lead	11.6 J	ND
Mercury	ND	ND
Nickel	85.4 J	28.2 BJ
Selenium	ND	ND
Vanadium	**671**	16.2 B

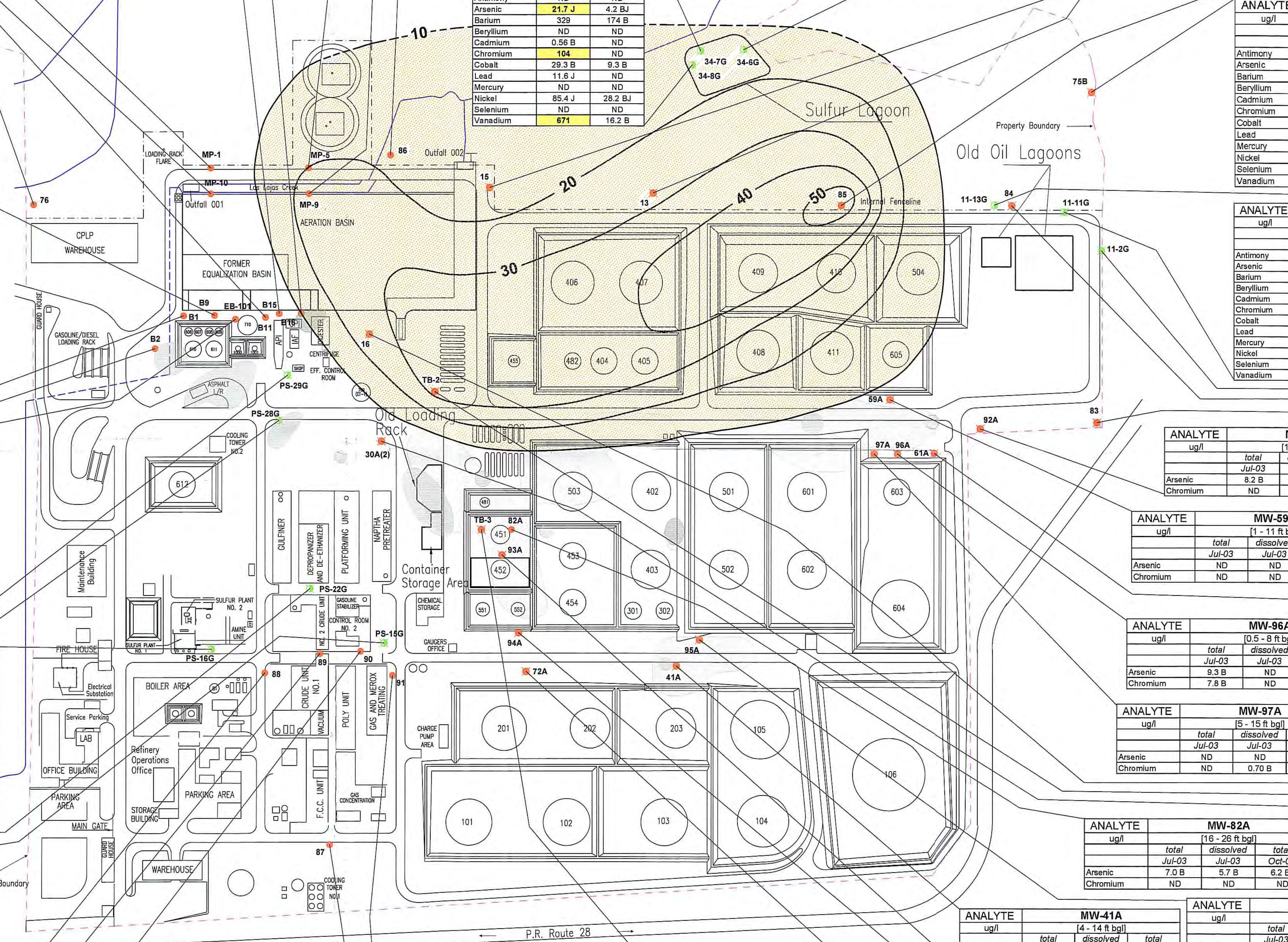
LEGEND

- Groundwater Monitoring Location
- Direct-push Groundwater Sampling Location
- Existing Well to be used for supplemental sampling
- Free Phase Hydrocarbon Plume-Upper Zone, Sep 2003
- Free Phase Hydrocarbon Plume-Lower Zone, Sep 2003
- Estimated Extent of Arsenic above MCL of 10 ug/l in Carbonate Sediment Water - Bearing Zone
- ~20~ Arsenic Concentration Contour ug/l

ANALYTE	MW-76A			MW-76B2		
ug/l	[4 - 14 ft bgl]			[45 - 55 ft bgl]		
	total	dissolved	total	total	dissolved	total
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	4.8 BJ	4.5 B	4.5 B	ND
Barium	91.5 B	93.6 B	79.7 B	424	445	463
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.5 B	ND	ND	ND	ND	0.56 B
Chromium	3.0 B	ND	2.8 B	4.2 B	ND	1.2 B
Cobalt	22.2 B	23.1 B	23.0 B	5.4 B	4.5 B	5.7 B
Lead	ND	ND	2.8 BJ	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	16.3 B	17.1 B	17.9 B	28.0 B	20.6 B	25.2 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	6.6 B	ND	3.7 B	9.6 B	1.0 B	4.6 B

ANALYTE	MW-75B		
ug/l	[45 - 55 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	---
Arsenic	2.8 B	ND	---
Barium	54.1 B	48.2 B	---
Beryllium	ND	ND	---
Cadmium	ND	ND	---
Chromium	5.9 B	ND	---
Cobalt	2.3 B	1.0 B	---
Lead	ND	ND	ND
Mercury	0.15 B	ND	ND
Nickel	3.8 B	2.0 B	---
Selenium	ND	ND	---
Vanadium	11.0 B	ND	---

ANALYTE	11-13G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**37.0**	**13.2**
Barium	619	557
Beryllium	1.1 B	ND
Cadmium	2.2 B	3.4 B
Chromium	58.9	6.6 B
Cobalt	85.4	94.0
Lead	4.4	ND
Mercury	0.16 BJ	ND
Nickel	71.3	58.5
Selenium	ND	ND
Vanadium	85.4	4.8 B



ANALYTE	B-9		
ug/l	[2.7 - 12.7 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	3.7 B	ND
Barium	57.5 B	46.1 B	163 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	1.0 B	ND	ND
Cobalt	ND	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.4 B	4.0 B	ND
Selenium	ND	ND	ND
Vanadium	2.4 B	4.0 B	5.5 B

ANALYTE	B-1		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	285	302	449
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	2.1 B	ND	ND
Cobalt	0.9 B	ND	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.7 B	3.8 B	ND
Selenium	ND	ND	ND
Vanadium	5.3 B	ND	ND

ANALYTE	11-11G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**45.1**	ND
Barium	198 B	233
Beryllium	0.67 B	ND
Cadmium	0.94 B	0.9 B
Chromium	67.8	ND
Cobalt	75.6	119
Lead	ND	ND
Mercury	0.38 J	ND
Nickel	84.8	87.6
Selenium	ND	ND
Vanadium	119	ND

ANALYTE	11-2G	
ug/l	[12 - 17 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**29.3**	ND
Barium	202	113 B
Beryllium	ND	ND
Cadmium	ND	ND
Chromium	73.0	ND
Cobalt	35.2 B	37.6 B
Lead	6.6	ND
Mercury	ND	0.1 BJ
Nickel	19.1 B	10.4 B
Selenium	ND	ND
Vanadium	89.2	ND

ANALYTE	MW-84A			MW-84B2		
ug/l	[5 - 15 ft bgl]			[41.9 - 51.9 ft bgl]		
	total	dissolved	total	total	dissolved	total
	May-03	May-03	Oct-03	May-03	May-03	Oct-03
Antimony	6.1 B	5.4 B	ND	ND	ND	ND
Arsenic	ND	ND	8.7 BJ	3.8 B	3.2 B	ND
Barium	966	895	900	207	208	194 B
Beryllium	ND	ND	ND	0.20 B	0.16 B	ND
Cadmium	ND	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	1.6 B	ND	ND
Cobalt	41.2 B	35.8 B	53.6	2.0 B	1.1 B	1.4 B
Lead	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND
Nickel	7.7 B	4.7 B	17.5 B	4.3 B	2.8 B	3.2 B
Selenium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	2.3 B	ND	ND

ANALYTE	B-2		
ug/l	[3.2 - 13.2 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	7.6 BJ
Barium	357	347	724
Beryllium	ND	ND	ND
Cadmium	ND	ND	2.6 BJ
Chromium	2.5 B	ND	1.9 BJ
Cobalt	ND	1.8 B	ND
Lead	2.7 B	ND	6.3 J
Mercury	ND	ND	ND
Nickel	6.5 B	3.9 B	ND
Selenium	3.5 B	ND	ND
Vanadium	1.0 B	ND	1.8 B

ANALYTE	EB-101		
ug/l	[12 - 22 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	147 B	153 B	184 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	1.4 B	1.8 B	1.4 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	3.9 B	3.4 B	2.9 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-92A		
ug/l	[1 - 11 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	8.2 B	3.6 B	5.7 BJ
Chromium	ND	ND	---

ANALYTE	MW-83A			MW-83B1			MW-83B2			MW-83B2D	
ug/l	[1.2 - 11.2 ft bgl]			[27 - 37 ft bgl]			[50.9 - 60.9 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved	total	total	dissolved	total	total	dissolved
	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03	Oct-03	May-03	May-03
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	5.0 BJ	ND	3.0 B	ND	ND	ND	ND	ND	ND
Barium	27.9 B	28.4 B	27.6 B	142 B	139 B	67.2 B	116 B	101 B	161 B	127 B	99.8 B
Beryllium	0.10 B	0.14 B	ND	ND	ND	ND	0.17	0.12 B	ND	0.16 B	0.10 B
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	4.8 B	ND	12.9	0.41 B	ND	ND	2.8 B	0.81 B	6.7 B	3.2 B	ND
Cobalt	ND	ND	ND	1.8 B	1.8 B	1.1 B	2.2 B	1.3 B	2.8 B	2.2 B	1.4 B
Lead	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	2.5 B	ND	8.2 B	2.4 B	2.6 B	ND	2.7 B	2.6 B	6.6 B	4.9 B	4.0 B
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	1.8 B	2.5 B	5.6 B	ND	ND	1.9 B	2.0 B	ND	7.1 B	3.2 B	ND

ANALYTE	MW-59A		
ug/l	[1 - 11 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	5.9 BJ
Chromium	ND	ND	ND

ANALYTE	PS-29G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	ND	ND
Barium	314	287
Beryllium	ND	ND
Cadmium	ND	ND
Chromium	4.9 B	1.3 B
Cobalt	2.3 B	1.2 B
Lead	2.6 BJ	ND
Mercury	ND	ND
Nickel	5.2 BJ	3.5 BJ
Selenium	ND	ND
Vanadium	10.6 B	ND

ANALYTE	PS-28G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**55.4**	ND
Barium	**3590**	622
Beryllium	**10.4**	ND
Cadmium	ND	ND
Chromium	**1130**	ND
Cobalt	160	1.6 B
Lead	**170**	ND
Mercury	ND	0.12 BJ
Nickel	297 J	3.6 BJ
Selenium	29.4 J	ND
Vanadium	**2850**	ND

ANALYTE	PS-16G	
ug/l	[15 - 20 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**30.0**	ND
Barium	489	1.5 B
Beryllium	0.79 B	ND
Cadmium	1.7 B	ND
Chromium	37.2	ND
Cobalt	7.4 B	ND
Lead	2.7 BJ	ND
Mercury	0.12 BJ	ND
Nickel	30.8 B	ND
Selenium	ND	ND
Vanadium	79.0	ND

ANALYTE	MW-96A		
ug/l	[0.5 - 8 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	9.3 B	ND	ND
Chromium	7.8 B	ND	---

ANALYTE	MW-61A		
ug/l	[2 -17 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	2.7 B	ND	6.6 BJ
Barium	134 B	132 B	132 B
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.4 BJ
Chromium	ND	ND	ND
Cobalt	0.62 B	0.62 B	ND
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	ND	ND	5.1 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-16A			MW-16B2			MW-16B2D
ug/l	[10 - 25 ft bgl]			[4 - 14 ft bgl]			(duplicate)
	total	dissolved	total	total	dissolved	total	total
	May-03	May-03	Oct-03	Jul-03	Jul-03	Oct-03	Oct-03
Antimony	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	**31.8**	**30.8**	**22.4 J**	**17.9 J**
Barium	122 B	119 B	111 B	654	654	612	602
Beryllium	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.46 B	0.41 B	2.6 BJ	ND	ND	ND	ND
Chromium	ND	ND	ND	ND	ND	1.8 BJ	ND
Cobalt	7.7 B	6.0 B	7.5 B	ND	ND	2.8 B	1.3 B
Lead	ND	ND	ND	ND	ND	ND	ND
Mercury	0.09 R	0.09 R	ND	ND	ND	ND	ND
Nickel	3.9 B	2.4 B	3.7 BJ	6.3 B	6.7 B	13.1 BJ	10.7 BJ
Selenium	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	3.2 B	0.89 B

ANALYTE	MW-97A		
ug/l	[5 - 15 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	ND	0.70 B	---

ANALYTE	PS-22G		PS-22GD	
ug/l	[4 - 14 ft bgl]		(duplicate)	
	total	dissolved	total	dissolved
	Jul-03	Jul-03	Jul-03	Jul-03
Antimony	ND	ND	ND	ND
Arsenic	3.6 BJ	8.2 BJ	ND	ND
Barium	294 J	545 J	279	254
Beryllium	ND	0.97	ND	ND
Cadmium	ND	1.0 B	ND	ND
Chromium	21.6 J	90.2 J	ND	ND
Cobalt	35.8 B	72.9	23.5 BJ	32.0BJ
Lead	3.6 J	9.4 J	ND	ND
Mercury	ND	ND	ND	ND
Nickel	19.1 B	45.6	11.0 B	11.1 B
Selenium	ND	ND	ND	ND
Vanadium	50.4 J	198 J	ND	ND

ANALYTE	PS-15G	
ug/l	[9 - 14 ft bgl]	
	total	dissolved
	Jul-03	Jul-03
Antimony	ND	ND
Arsenic	**14.4**	ND
Barium	690	312
Beryllium	1.1 B	ND
Cadmium	ND	ND
Chromium	51.8	ND
Cobalt	43.8 B	18.1 BJ
Lead	**17.0**	ND
Mercury	ND	ND
Nickel	35.0 B	11.4 B
Selenium	3.4 BJ	ND
Vanadium	117	ND

ANALYTE	MW-82A			MW-82AD	
ug/l	[16 - 26 ft bgl]			(duplicate)	
	total	dissolved	total	total	dissolved
	Jul-03	Jul-03	Oct-03	Jul-03	Jul-03
Arsenic	7.0 B	5.7 B	6.2 BJ	7.0 B	ND
Chromium	ND	ND	ND	1.6 B	ND

ANALYTE	MW-30-A(2)		
ug/l	[3 - 13 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	3.9 B	ND
Arsenic	**16.5**	**16.7**	**33.5 J**
Barium	377	390	600
Beryllium	ND	ND	ND
Cadmium	ND	ND	1.3 BJ
Chromium	ND	ND	0.85 BJ
Cobalt	1.2 B	1.7 B	1.5 B
Lead	5.9	4.4	2.8 B
Mercury	ND	ND	ND
Nickel	ND	ND	5.6 BJ
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-TB2		
ug/l	[40.5 - 50.5 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	**36.6**	**33.4**	**31.7**
Barium	704	728	731
Beryllium	ND	ND	ND
Cadmium	ND	ND	ND
Chromium	ND	ND	ND
Cobalt	1.5 B	0.87 B	0.89 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	13.2 B	10.7 B	17.0 B
Selenium	ND	ND	ND
Vanadium	ND	ND	ND

ANALYTE	MW-95A		
ug/l	[9 - 19 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	3.9 BJ	ND	ND
Chromium	6.8 BJ	ND	---

ANALYTE	MW-41A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	**53.9**	8.9 B	6.1 BJ
Chromium	33.5	ND	ND

ANALYTE	MW-93A		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	1.0 BJ	ND	---

ANALYTE	MW-94A		
ug/l	[2 - 12 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	4.7 BJ	5.0 BJ	ND
Chromium	12.5 J	ND	---

ANALYTE	MW-87A		
ug/l	[9 - 19 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	ND
Chromium	12.6	11.8	15.3 J
Selenium	ND	3.5 B	ND

ANALYTE	MW-TB3			MW-TB3D
ug/l	[39 - 49 ft bgl]			duplicate
	total	dissolved	total	total
	May-03	May-03	Oct-03	Oct-03
Antimony	ND	2.8 B	ND	ND
Arsenic	ND	ND	ND	ND
Barium	92.3 B	85.3 B	83.0 B	83.7 B
Beryllium	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND
Chromium	0.87 BJ	1.5 B	ND	ND
Cobalt	0.86 B	1.1 B	ND	ND
Lead	ND	ND	ND	ND
Mercury	0.18 B	ND	ND	ND
Nickel	5.8 B	8.6 B	6.8 BJ	7.1 BJ
Selenium	ND	ND	ND	ND
Vanadium	1.5 B	1.6 B	1.2 B	0.86 B

ANALYTE	MW-72A		
ug/l	[2 - 17 ft bgl]		
	total	dissolved	total
	May-03	May-03	Oct-03
Antimony	ND	ND	ND
Arsenic	ND	ND	ND
Barium	53.6 B	45.3 B	77.9 B
Beryllium	0.28 B	0.13 B	ND
Cadmium	0.36 B	ND	ND
Chromium	1.2 BJ	ND	1.6 B
Cobalt	1.3 B	ND	3.0 B
Lead	ND	ND	ND
Mercury	ND	ND	ND
Nickel	2.1 B	2.3 B	ND
Selenium	ND	ND	ND
Vanadium	2.5 B	1.3 B	3.7 B

ANALYTE	MW-88A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	---	ND
Chromium	ND	---	ND
Selenium	ND	---	ND

ANALYTE	MW-89A		
ug/l	[5.3 - 15.3 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	7.1 B	8.4 B	**11.4 J**
Chromium	ND	1.1 B	ND
Selenium	ND	3.3 B	ND

ANALYTE	MW-90A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	ND	ND	5.4 BJ
Chromium	0.8 B	ND	ND
Selenium	ND	ND	ND

ANALYTE	MW-91A		
ug/l	[4 - 14 ft bgl]		
	total	dissolved	total
	Jul-03	Jul-03	Oct-03
Arsenic	8.1 B	7.5 B	**24.4**
Chromium	5.5 B	4.4 B	11.6
Selenium	5	3.8 B	ND

450 0 450
Scale feet

Scale	Date
1/2400	Jan 2004

ANDERSON - MULHOLLAND & ASSOCIATES, INC.
WHITE PLAINS, NEW YORK
SAN JUAN, PUERTO RICO

Figure 6-3

Dissolved Arsenic Plume in Carbonate Sediment Water - Bearing Zone

Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

Figure 7

Apparent Product Thickness Map
Upper Clayey-Sediment
Water-Bearing Zone
(Zone A)

Date of Product Thickness Measurements
September 30, 2003

Underground Recovery System
Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico

Legend

- >1 foot
- 0-1 foot
- Sheen
- Product Boundary (dashed where inferred)

0 200 400

Scale (feet)

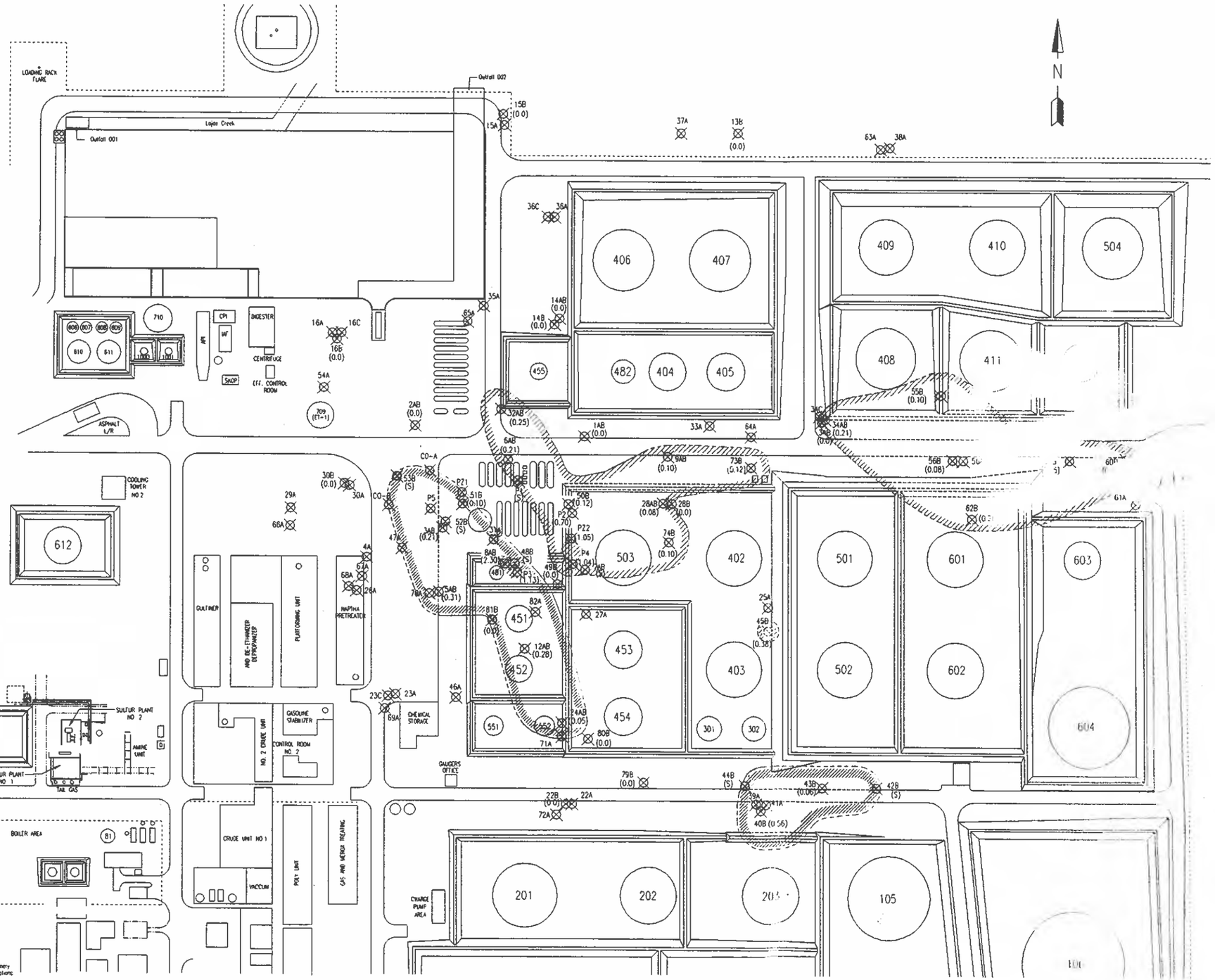
Anderson-Mulholland & Associates, Inc.
White Plains, New York

Figure 8

Apparent Product Thickness Map
Unlithified Calcareous Sediment
Water-Bearing Zone (Zone B)

Date of Product Thickness Measurements
September 30, 2003

Underground Recovery System
Caribbean Petroleum Refining, LP
Bayamon, Puerto Rico



Legend

- >1 foot
- 0-1 foot
- Sheen
- Product Boundary (dashed where inferred)

0 200 400

Scale (feet)

Anderson-Mulholland & Associates, Inc.
White Plains, New York

ARCADIS PUERTO RICO

Appendix H

Figures Depicting Areas Impacted by 2009 Incident

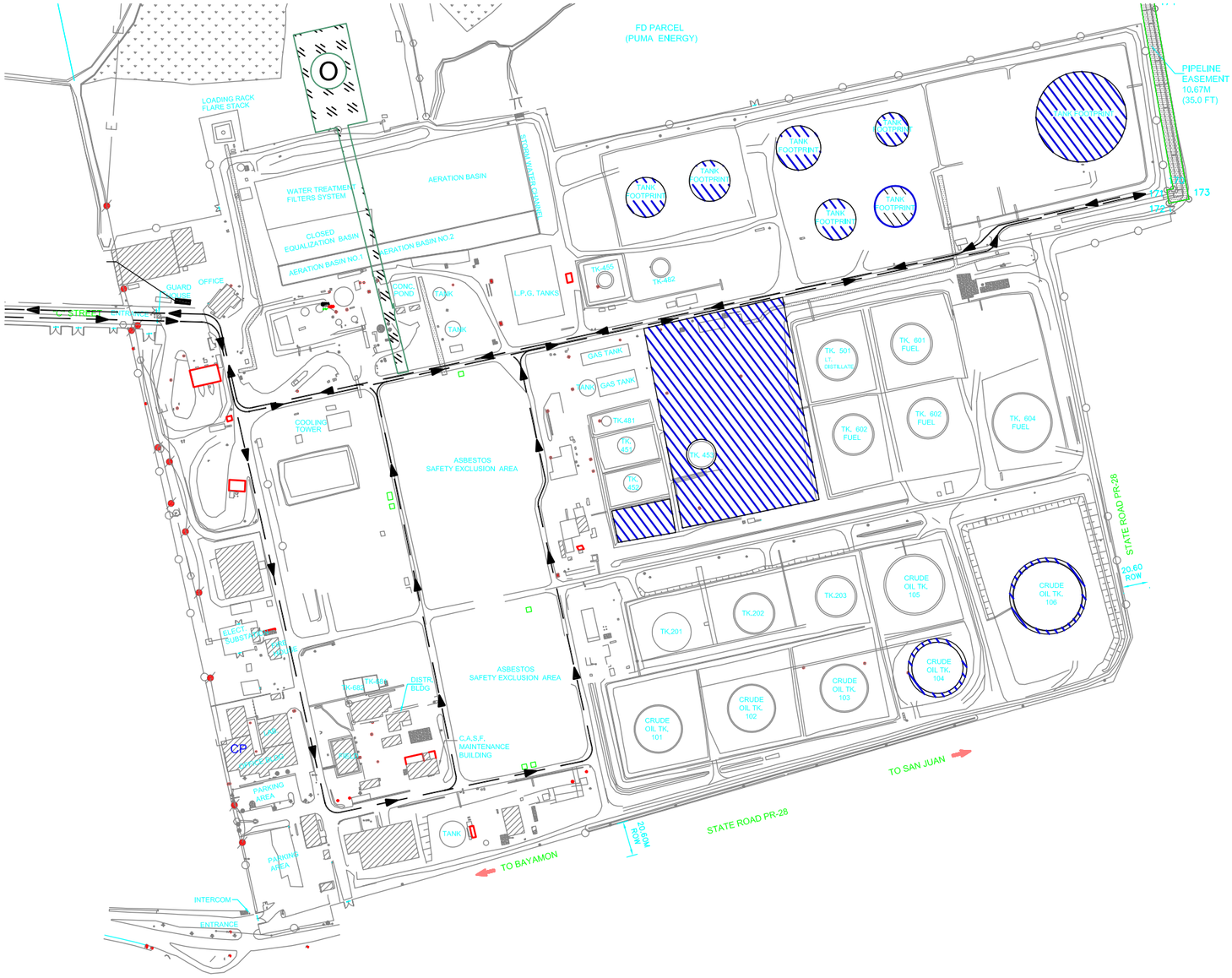
PUMA ENERGY CARIBE - TANK FARM PARCEL
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON. PUERTO RICO

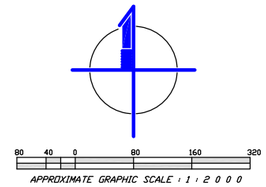
TANKS DAMAGED DURING FIRE

ARCADIS PUERTO RICO

FIGURE
H1

CITY:Tampa DIV/GROUP:(Reqd) DB:M. Vives LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\PROJECTS\2012\PUMA ENERGY\45714 - RCRA Corrective Action\Draft and Final Presentations\Draft Report\Figures\45714_Soil removed by EPA.dwg LAYOUT: H1 SAVED: 4/30/2012 3:09 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: --- PLOTTED: 4/30/2012 3:22 PM BY:
FLORES, NELSON





LEGEND

SOIL REMOVED BY EPA

PUMA ENERGY CARIBE - TANK FARM PARCEL
STATE ROAD PR-28, JUAN SANCHEZ WARD
BAYAMON. PUERTO RICO

SOIL REMOVED BY EPA

ARCADIS PUERTO RICO

FIGURE
H2